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CONTENTS OF PREVIOUS NUMBER

FEBRUARY, 1928. NUMBER 2

Suppuration of the Lung:
- Medical Aspect. Thomas McRae, M.D., F.R.C.P. (Lond.), Philadelphia.
- Surgical Aspect. Willy Meyer, M.D., New York.
- Roentgenologic Aspect. Willis F. Manges, M.D., Philadelphia.
- Laryngologic Aspect. Joseph H. Bryan, M.D., Washington, D. C.
- Bronchoscopic Aspect. Gabriel Tucker, M.D., Philadelphia.
- Discussion.

External Operation on the Frontal Sinus: A Critical Review. William Mithoefer, M.D., Cincinnati.

Mucocele of the Accessory Nasal Sinuses. Clyde A. Heatly, M.D., Rochester, N. Y.

Intratracheal Inhalation Anesthesia: The Method of Election for Operations on the Head and Neck. P. J. Flagg, M.D., New York.

Clinical Notes:
- Otalgia from Abscess of the Tongue Controlled by Cocainization of the Nasal Ganglion. French K. Hansel, M.D., St. Louis.
- A New Treatment for Vincent's Angina. R. G. Reaves, M.D., Knoxville, Tenn.

Progress in Otolaryngology: A Summary of the Bibliographic Material Available in the Field of Otolaryngology. Anatomy and Physiology of the Ear: Review of the Literature from October, 1926, to October, 1927. Philip Meltzer, M.D., Boston.

News and Comment.

Abstracts from Current Literature.

Society Transactions:
- Section on Otology and Laryngology of the College of Physicians of Philadelphia.

Book Reviews.

Directory of Ophthalmological and Otolaryngological Societies.

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ARCHIVES OF OTOLARYNGOLOGY

VOLUME 7 MARCH, 1928 NUMBER 3

SIMPLE SUBCORTICAL MASTOIDECTOMY

JULIUS LEMPERT, M.D.
NEW YORK

Simple subcortical mastoidectomy is an operation for the posterior drainage of the vault and for the exenteration of all the diseased cells of the mastoid process without the removal of the outer mastoid cortex, the posterior bony wall of the canal being used as a new method of approach.

Before describing this operation in detail, a simple review of the well known anatomic and pathologic facts which have a direct bearing on the procedure may be of value. These are:

1. The external wall of the mastoid cortex is a much denser and thicker structure than the anterior wall of the mastoid cortex, which enters into the formation of the posterior bony wall of the canal.

2. The majority of the mastoid cells are situated between the posterior bony wall of the external auditory canal and the thin bony plate covering the lateral sinus.

3. The aditus and antrum are anatomic landmarks never absent and located much nearer to the bony, superoposterior wall of the external auditory canal than to the external wall of the mastoid cortex.

4. The lateral sinus is never found in close proximity to the anterior wall of the mastoid cortex.

5. The outer mastoid cortex is rarely involved pathologically.

6. Perforations in the outer wall of the mastoid cortex almost always occur in its upper anterior margin directly over the antrum and involve only a small area of cortex.

7. Even in complete sclerosis of the central chamber, the aditus and antrum never become sclerotic.

There are certain surgical landmarks which are important guides in performing this operation. They are the following: 1. The aditus. An imaginary line is drawn along the superoposterior wall of the canal which extends from the anulus tympanicus internally, beginning with the superoposterior attachment of the tympanic membrane, up to the spine of Henle externally. This line is divided into three equal parts, and the point at which the inner third meets the middle third is the surgical landmark. If a fine, electrically driven dental burr is applied at this point and guided posteriorly and inwardly, the aditus and antrum are reached. The aditus is a reliable surgical landmark, since it is always present. It always maintains its anatomic and surgical relationship to

the posterior bony wall of the canal and to the antrum no matter what pathologic change the mastoid process may have undergone. By exposing the aditus through the bony wall of the canal one is able to expose the antrum which is a continuation of the aditus posteriorly into the mastoid process.

2. The external semicircular canal. This canal, which lies behind the posterior wall of the aditus, is exposed by the removal of some of the granulations from the floor of the aditus. Because of its location on the floor of the aditus, which is the first landmark exposed, it acts as a guide to the successful exenteration of the mastoid cells. It also acts as a protection against accidental injury to the facial nerve, as it marks the lowest level of safety in the process of curettement.

OPERATION

Position of Patient.—The patient is placed flat on his back with his face turned toward the anesthetist, who sits on the side opposite to the affected ear. A sandbag is placed under the neck of the patient so that the head lies in a position which brings the mastoid process parallel to the table.

Position of Surgeon.—When operating on the right mastoid, the right-handed surgeon stands to the right of the patient and faces left; when operating on the left mastoid, he stands posterior to the head of the patient, looking caudad.

Position of First Assistant.—When the operation is being performed on the right mastoid, the first assistant stands at the head of the patient; when on the left mastoid, he stands to the left of the patient's head. If the surgeon is left handed, these positions are reversed.

Preparation of Operative Field.—The external auditory meatus is wiped and dried with sterile cotton applicators. The auricle, the skin lining the entire canal and the membrane of the drum are painted with 3 per cent tincture of iodine and then washed with 95 per cent alcohol.

Control of Bleeding.—A 2 per cent solution of procaine and epinephrine is injected with a hypodermic syringe into the skin lining the bony and membranous portions of the posterior wall of the canal. This prevents excessive bleeding when these tissues are incised, thus making the use of hemostats unnecessary.

STEPS IN OPERATION

Exposure of Posterior Bony Wall of External Auditory Canal.—An incision is made through the skin lining the posterior wall of the canal down to the bone. This incision is started immediately in front of or external to the tympanic membrane, extending from the superior margin of the posterior wall of the external auditory canal down to the lower limit of the posterior wall of the canal and following the course of the posterior attachment of the tympanic membrane to the tympanic ring. Beginning with the upper end of this incision, another incision is begun at right angles to it and extended outward along the entire length of the superoposterior wall of the canal into the membranous portion and out to the lower margin of the helix. A third and final incision is made beginning with the lower margin of the first incision, which corresponds with the lowest level of the posterior bony wall of the canal and is carried outward and upward to meet the outer end of the second incision, thus forming a

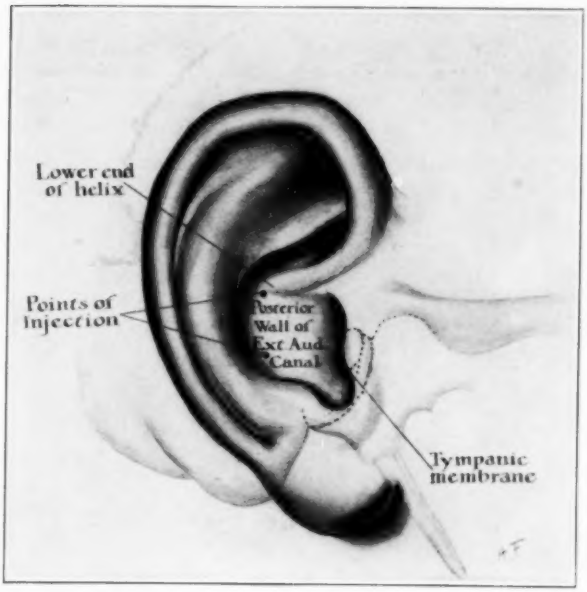

Fig. 1.—Points of injection of procaine and epinephrine.

Fig. 2.—Incision in posterior wall of external auditory canal.

triangle. These three incisions are carried down to the bone. With a small periosteal elevator the entire triangular portion of the skin is raised from the posterior bony wall of the canal by introducing the elevator into the external auditory meatus and beginning the elevation at the base of the triangular incision. By elevating and removing this triangular portion of skin, the posterior bony wall of the canal is exposed and therefore the anterior wall of the mastoid cortex.

Introduction of Retractors.—The first assistant now introduces two small sharp retractors between the edges of skin which form the upper outer angle of the

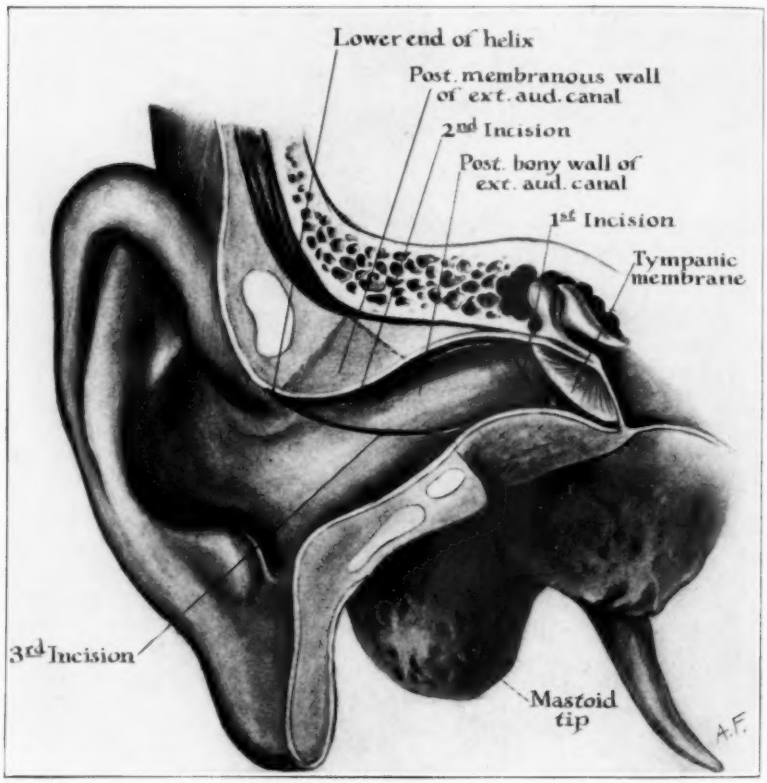

Fig. 3.—Sectional view showing incision in posterior wall of external auditory canal.

triangle. With proper retraction, the entire anterior wall of the mastoid cortex is exposed.

Exploration of Aditus.—With the entire posterior bony wall of the canal exposed, an imaginary line is drawn along the superoposterior wall, beginning immediately externally to the posterosuperior attachment of the tympanic membrane internally extending up to the spine of Henle externally. This line is divided into three equal parts. At the point at which the inner third meets the middle third, a fine, electrically driven dental burr is applied and guided posteriorly and inwardly until the aditus is reached. In acute suppurative mastoiditis there is an immediate

Fig. 4.—Elevation of soft parts from the posterior wall of canal.

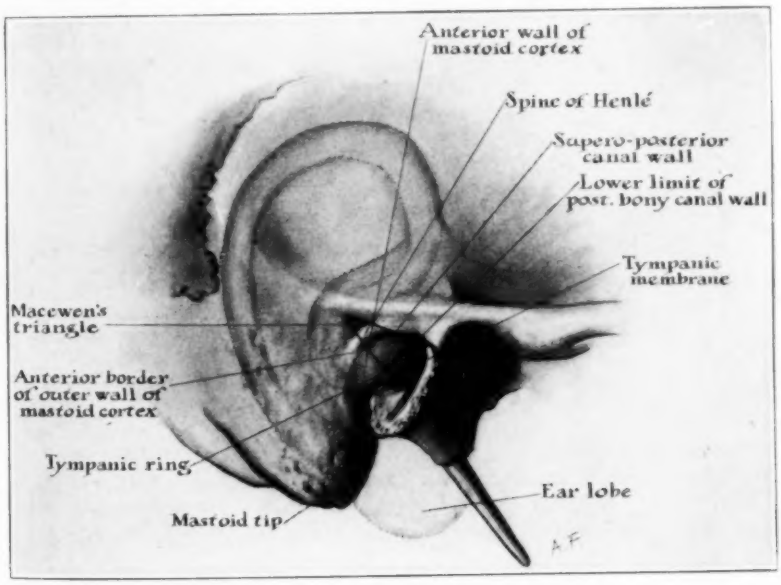

Fig. 5.—Area of posterior bony wall of canal exposed by the removal of skin.

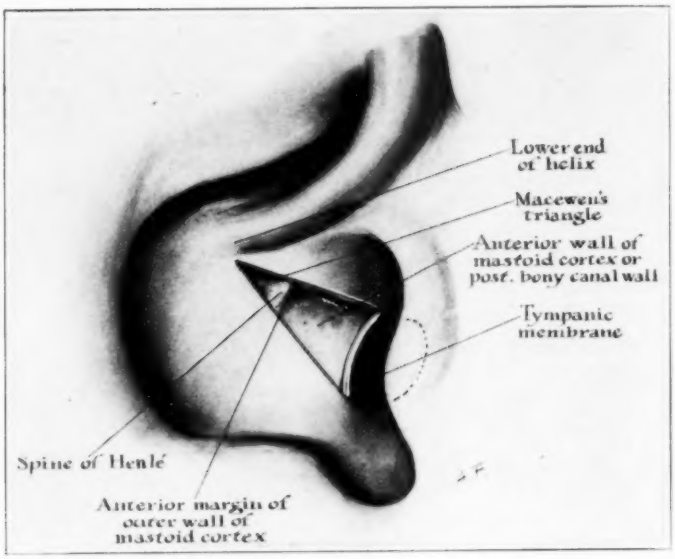
Lower end of helix
Macewen's triangle
Anterior wall of mastoid cortex or post. bony canal wall
Tympanic membrane
Spine of Henlé
Anterior margin of outer wall of mastoid cortex

Fig. 6.—Exposure of posterior bony wall of canal.

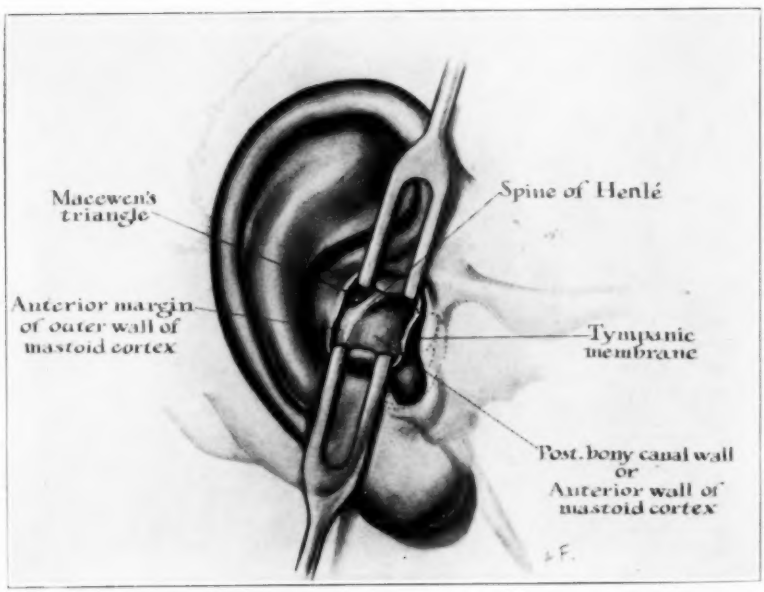
Macewen's triangle
Spine of Henlé
Anterior margin of outer wall of mastoid cortex
Tympanic membrane
Post. bony canal wall or Anterior wall of mastoid cortex

Fig. 7.—Retractors in situ and field of operation exposed.

gush of pus on entrance into the aditus. The opening created by the burr is enlarged with the same burr, thus making the aditus freely accessible to the curet.

Cleaning of Aditus and Exposure of External Semicircular Canal.—The opening within the posterior wall of the canal is sponged with gauze tips, and a no. 2 modified Friesner curet is introduced into the aditus. The granulations found on the floor of the aditus are removed carefully, thus exposing the external semicircular canal which is the surgical guide to the completion of the subcortical mastoidectomy. While the surgeon is curetting the floor of the aditus, the anesthetist is instructed to watch the patient's face carefully for unilateral facial spasm, remembering that beneath the floor of the aditus is the bend of the facial nerve.

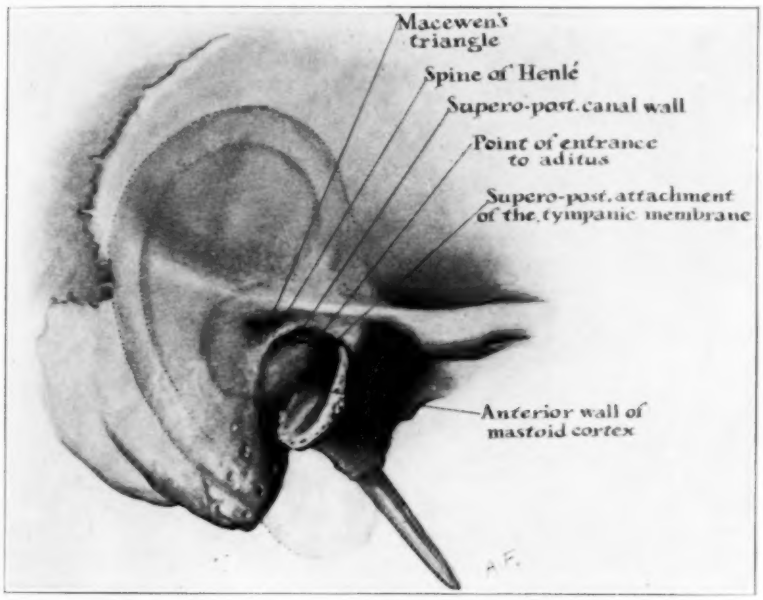
Macewen's triangle
Spine of Henlé
Supero-post. canal wall
Point of entrance to aditus
Supero-post. attachment of the tympanic membrane
Anterior wall of mastoid cortex

Fig. 8.—Surgical landmark of approach to aditus.

Removal of the Roof Cells Within the Aditus.—The roof of the aditus is curetted with freedom, and all the cells adjacent to it are removed until the shiny solid dural plate is exposed. If the dural plate is necrotic, it will come away with the roof cells, and the dura will thus be exposed.

Exposure and Cleaning of Antrum.—When the granulations within the aditus have been removed and the external semicircular canal and roof of the aditus have been exposed, the next procedure is to curet freely backward into the antrum with a no. 3 modified Friesner curet. All the granulations are removed from within the antrum until there is a clean continuous cavity leading from the aditus through the antrum into the mastoid cells posteriorly.

The roof cells of the antrum are removed until the bony dural plate is exposed and forms a continuous smooth plate with that of the aditus. It is best to remove a diseased dural plate in this region and to expose the dura.

Fig. 9.—Technic of opening into aditus; drill on site of entrance.

Fig. 10.—Entrance to aditus.

Fig. 11.—Enlarging opening into aditus.

Fig. 12.—Opening into aditus enlarged.

Fig. 13.—Cleaning out of aditus.

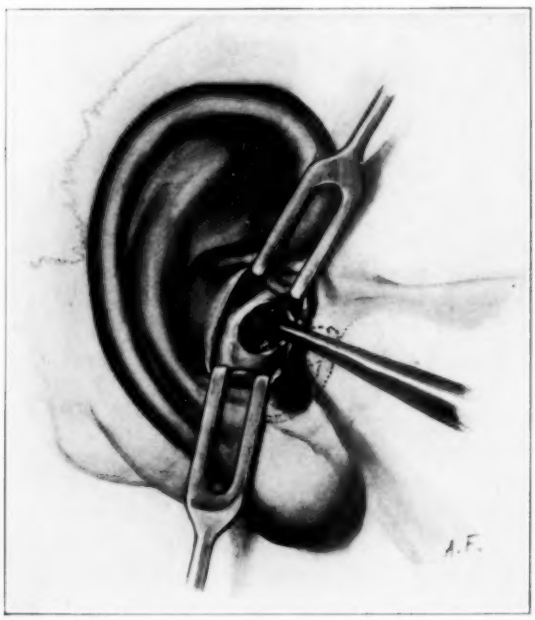

Fig. 14.—Cleaning out of antrum.

Fig. 15.—Aditus and antrum cleaned out and external semicircular canal exposed.

Fig. 16.—Removal of entire anterior wall of mastoid cortex.

Exposure of Mastoid Cells.—The exposed area of the anterior wall of the mastoid cortex is removed with an electrically driven round burr throughout its entire extent, working from within outward and above downward until the anterior border of the outer wall of the mastoid cortex is reached.

Exenteration of All the Mastoid Cells of the Central Chamber of the Mastoid Process.—With both antrum and aditus exposed and cleaned, the removal of the mastoid cells is simple. The anatomy of the mastoid process is now understood and all the cells encountered are exenterated with a no. 3 modified Friesner curet until all the surgical limitations of the mastoid process have been reached and fully exposed. These surgical limitations or landmarks are: (*a*) the incus; (*b*) the external semicircular canal; (*c*) a continuous smooth dural plate free

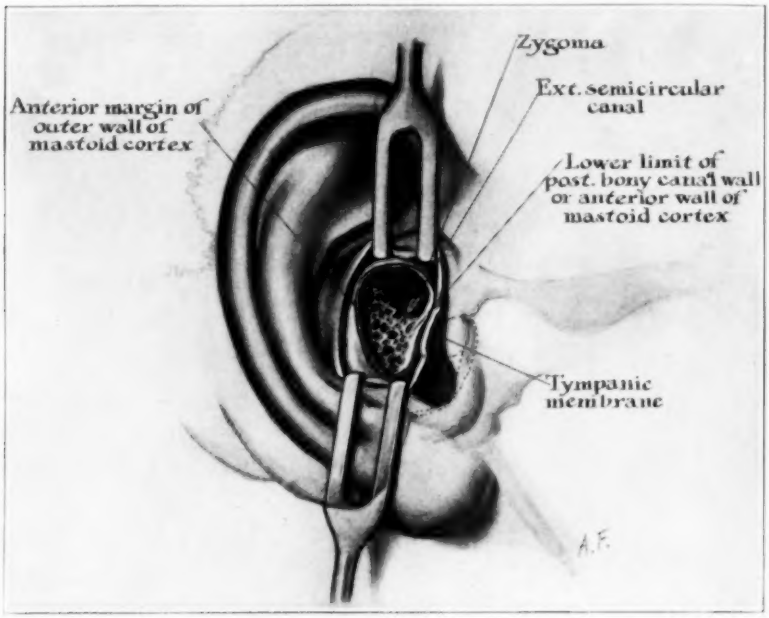
Zygoma
Ext. semicircular canal
Anterior margin of outer wall of mastoid cortex
Lower limit of post. bony canal wall or anterior wall of mastoid cortex
Tympanic membrane
A.F.

Fig. 17.—Entire anterior wall of mastoid cortex removed and all the cells within the central chamber exposed.

from cells and granulations extending from the aditus through the antrum up to the posterior angle of Trautman's triangle; (*d*) complete exposure of the smooth bony plate covering the entire length and width of the lateral sinus, beginning with the posterior angle of Trautman's triangle and following its course downward through the mastoid process into the mastoid tip, where it disappears into the jugular fossa; (*e*) exposure of the smooth bony inner limit of the mastoid process; (*f*) exposure of the smooth inner bony plate of the mastoid tip and (*g*) smoothly curretted inner surface of the preserved outer mastoid cortex with all cortical cells removed down to the lower limit of the mastoid tip.

Routine of Exenteration of Mastoid Cells in Subcortical Mastoidectomy.—With the aditus and antrum exposed in the very beginning of this operation, the mastoid cells are exenterated best in the following order: 1. The roof cells are removed; this was described under the surgical treatment of aditus and antrum.

2. The zygomatic cells are then removed. This is best accomplished by first removing the outer cortex forward over the spine of Henle and along the posterior root of the zygoma with a small, round, electrically driven dental burr. This opening is extended upward to the level of the inner plate which forms part of the floor of the midcranial fossa and the cells thus exposed are removed with a no. 2 modified Friesner curet.

3. The third process is the removal of perisinus cells, thus outlining the sigmoid groove. For the purpose of classification, I have divided these cells into three groups: (1) the superior perisinus cells, which are the cells situated immediately above the lateral sinus in Trautman's triangle, namely, between the sinus and the mastoid roof; (2) the anterior perisinus cells, or those situated between the posterior wall of the canal and the osseous covering of the sigmoid sinus,

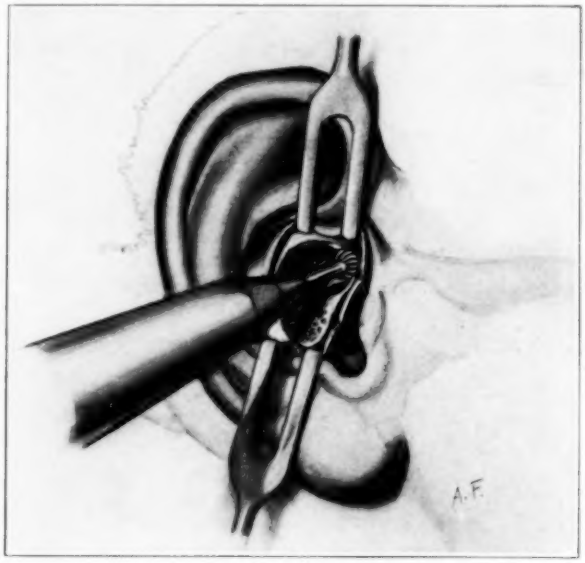

Fig. 18.—Removal of zygomatic cells.

i. e., the cells situated in the groove in front of the sigmoid sinus and behind the posterior wall of the canal and (3) the posterior perisinus cells, which are the posterior mastoid cells situated behind or posterior to the sigmoid sinus.

The no. 3 modified Friesner curet is used. This is best accomplished by beginning the exenteration along the posterior end of the antrum. By curetting from before backward, all the cells encountered between the upper border of the lateral sinus and the mastoid roof are removed. These cells are situated between the middle and posterior fossae. When this is accomplished, there should be a thoroughly cleaned out Trautman's space extending backward from the aditus, with a continuous inner plate separating the middle and posterior fossae above from the lateral sinus below. If any portion of the dural plate is necrotic, it should be removed and the dura exposed.

With a no. 3 modified Friesner curet all the cells encountered posterior to the opening in the posterior wall of the canal, up to the anterior limit of the osseous covering of the sigmoid sinus, are removed, until the entire sigmoid groove is

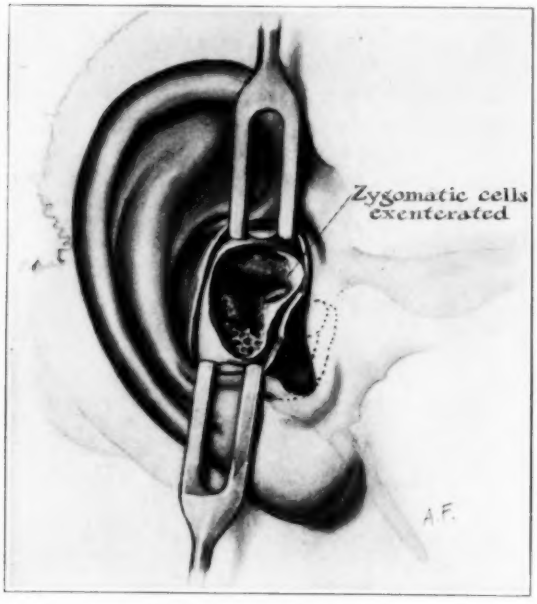

Fig. 19.—Zygomatic cells removed.

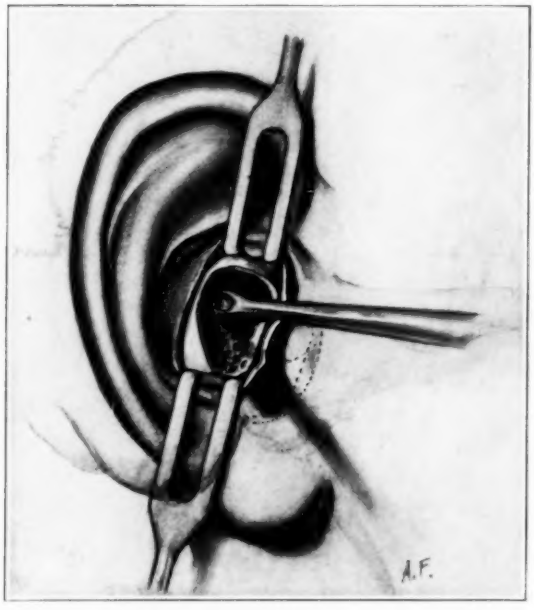

Fig. 20.—Exenteration of cells within Trautman's triangle or removal of superior perisinus cells.

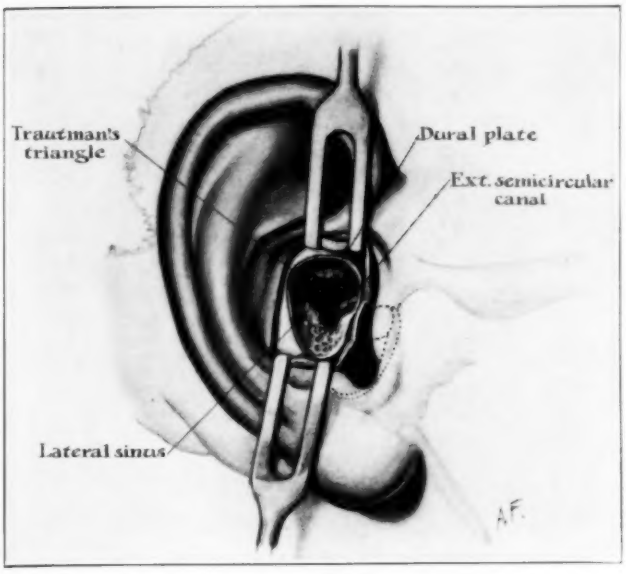

Fig. 21.—Superior perisinus cells removed and Trautman's triangle cleaned out.

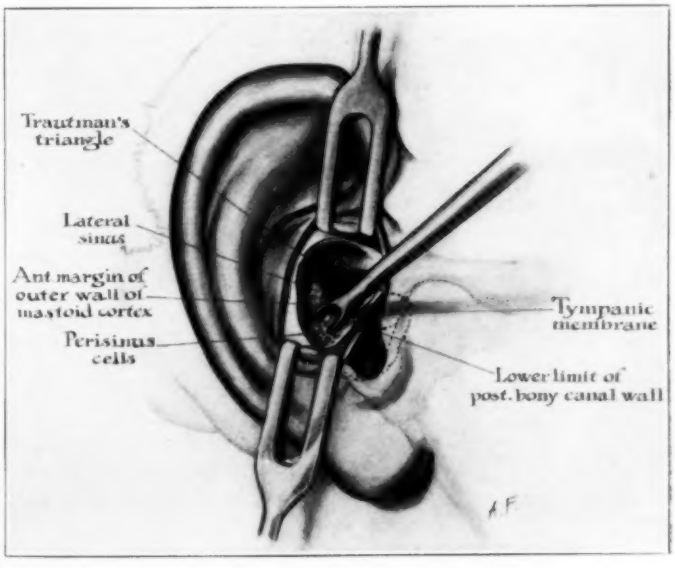

Fig. 22.—Removal of anterior perisinus cells.

outlined. With the external semicircular canal as a guide, I curet from above downward beginning with Trautman's triangle and following the wall of the sinus down to the tip of the mastoid, where the sinus disappears into the jugular fossa. All the cells behind or posterior to the opening in the posterior bony wall of the canal and in front of or anterior to the sigmoid sinus down to the inner limit of safety are thus removed, until the entire length of the sinus is exposed and a smooth sinus plate, a smooth solid inner surface of the mastoid process and a smooth posterior surface of the lower limit of the posterior wall of the canal are seen. A diseased plate should be removed and the sinus exposed.

4. With a no. 3 modified Friesner curet all the cells encountered within the mastoid tip are exenterated until a smooth inner wall of the outer tip cortex and a smooth inner plate of the mastoid tip are presented.

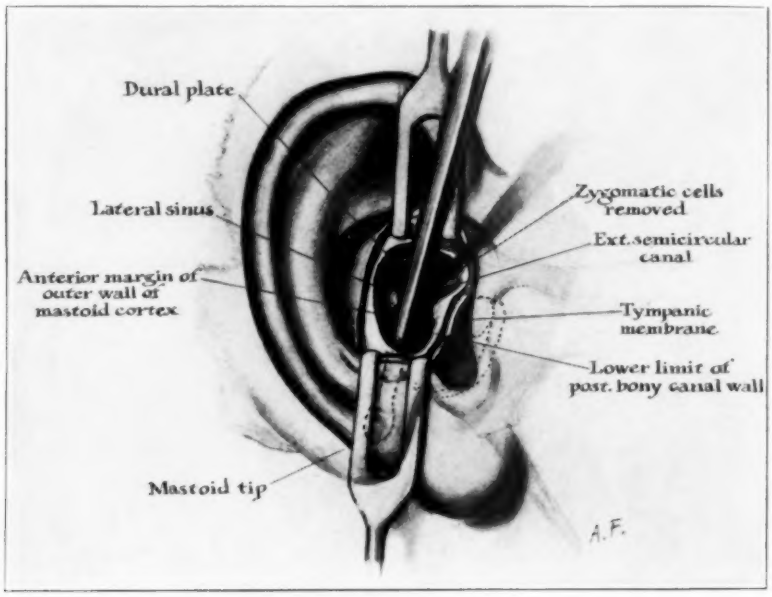

Fig. 23.—Exenteration of tip cells.

5. With the same curet, the cortical cells are removed, if present, until the cells situated behind or posterior to the sigmoid sinus are reached; the posterior cells are exenterated until the smooth posterior limit of the osseous covering of the sigmoid sinus is completely exposed.

All the cells within the mastoid process are thus removed by way of the new approach, namely, through an opening established through the posterior bony wall of the external auditory canal by the complete removal of the thin anterior wall of the mastoid cortex. This opening is sufficiently large to permit the removal of every cell within the mastoid process, the surgeon being able to see the entire operative field. The thick outer wall of the mastoid cortex is left intact.

Surgical Treatment of Cortical Perforations.—These perforations are usually small in diameter.

(*a*) Perforation of the outer wall of the mastoid cortex, which is usually situated directly over the antrum, is the perforation most commonly encountered.

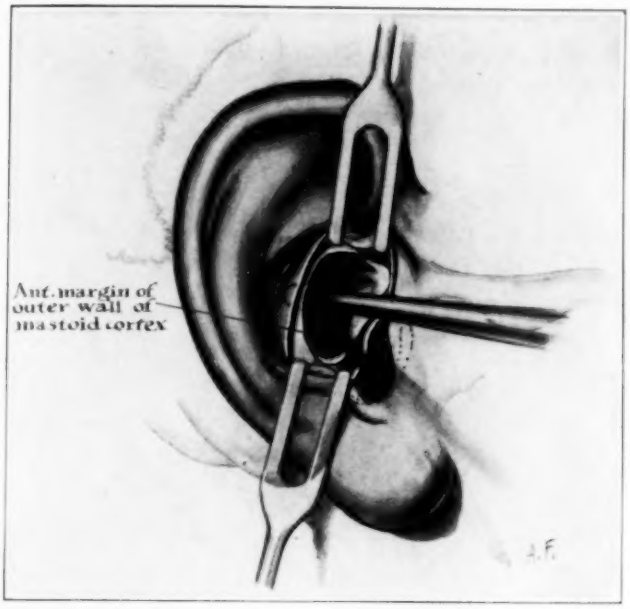

Fig. 24.—Removal of posterior perisinus cells.

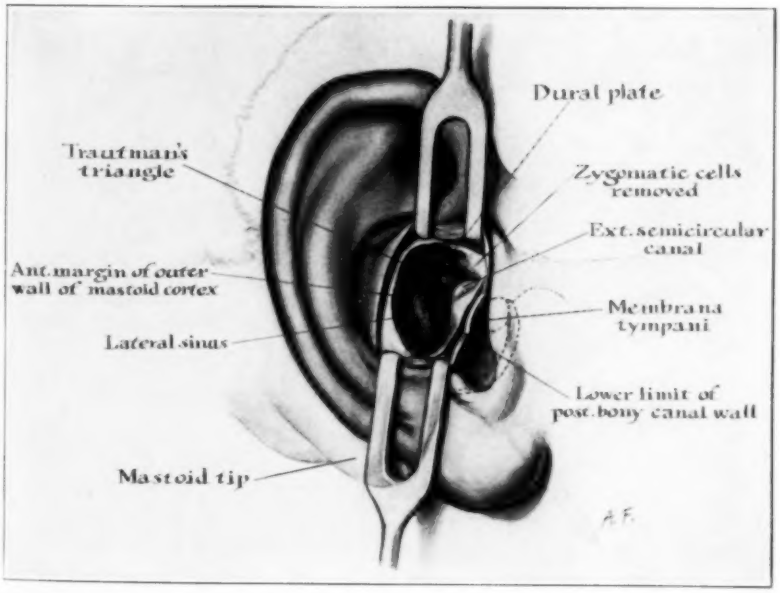

Fig. 25.—Anteroposterior view of completely exenterated mastoid cavity.

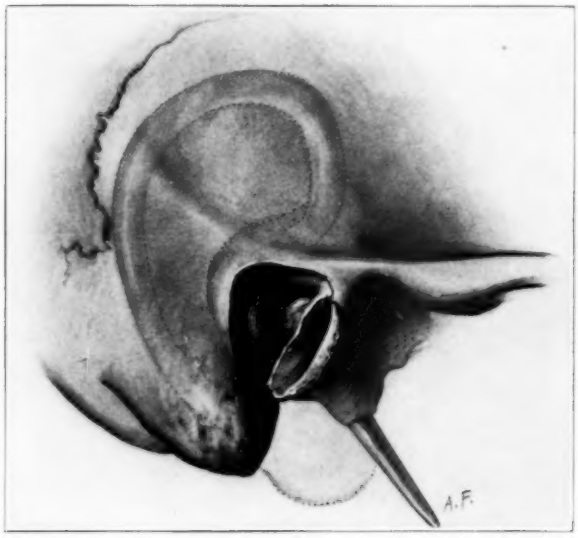

Fig. 26.—Transparent view of mastoid process after completion of simple subcortical mastoidectomy, showing all the mastoid cells completely exenterated with the entire outer wall of the mastoid cortex still intact.

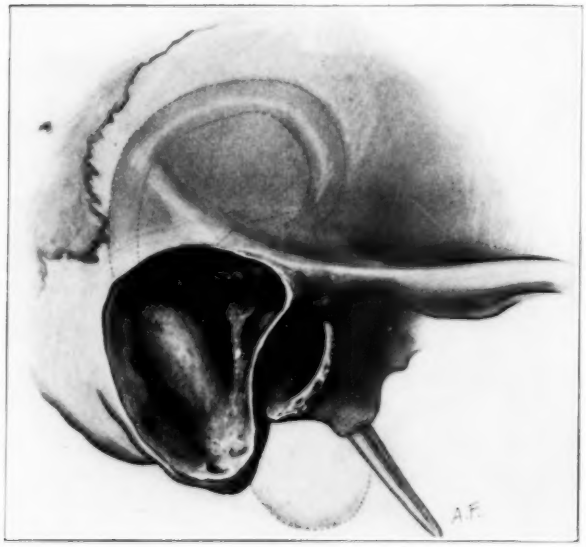

Fig. 27.—View of mastoid process after completion of Schwartze mastoidectomy, showing the entire outer wall of mastoid cortex removed.

forming what is known as a subperiosteal mastoid abscess. The best treatment is removal of the necrotic part of the mastoid cortex with a no. 3 curet until healthy edges are reached. This involves the sacrifice of only a small portion of the upper anterior border of the outer mastoid cortex. The pus from underneath the periosteum empties itself into the mastoid cavity and is drained through the opening in the posterior wall of the canal.

(*b*) The zygomatic perforation is found in the outer cortex of the zygoma. In the process of exenteration of the zygomatic cells such a perforation is necessarily cared for.

(*c*) Perforation is also seen through the bony plate forming the inner surface of the mastoid tip. The pus accumulates under the muscles attached to the tip and forms what is known as Bezold's abscess. After all the granulations and cells are removed from within the tip, the necrotic area within the inner wall of the mastoid tip which represents the perforation is curetted with a no. 3 curet

Fig. 28.—Packing of mastoid cavity.

until a solid healthy edge is reached. It is not necessary to remove the outer cortex in order to accomplish this. The muscles in the neck are gently massaged until all the pus which has accumulated underneath the muscles is emptied into the mastoid cavity and drained through an opening in the posterior wall of the canal.

Experience has proved that all accumulations of pus underneath the periosteum or muscle can be surgically drained through the opening in the posterior wall of the canal without the necessity of ever making a postauricular incision.

Cleansing of Mastoid Cavity and External Auditory Meatus.—The mastoid cavity is flushed with warm physiologic sodium chloride solution and then dried with sterile gauze tips. The external auditory meatus is cleansed with cotton applicators, and all detritus is removed from in front of the tympanic membrane.

Inspection of Operative Field.—Looking into the external auditory canal, one sees the largest part of the posterior wall of the canal with the exception of its lower limit absent; one also sees the membrana tympani, intact and flattened.

Fig. 29.—Packing external auditory canal.

Fig. 30.—View of auricle after completion of subcortical mastoidectomy.

Looking posteriorly through the opening created by removal of the posterior wall of the canal, one can now inspect the entire mastoid cavity with its complete surgical anatomy exposed and the outer mastoid cortex intact.

Packing of Mastoid Cavity and External Auditory Canal.—The mastoid cavity is packed lightly with sterile narrow strip gauze. A small piece of sterile gauze packing is introduced lightly into the external auditory canal up against the tympanic membrane, thus maintaining the contour of the canal. The outer ends of both strips of gauze should protrude outward from the canal. The mastoid dressing and bandage are then applied.

POSTOPERATIVE TREATMENT

Children are allowed to sit up in bed as soon as they fully come out of the anesthetic. If the child does not have a rise in temperature on the third day, he is allowed out of bed.

Adults are allowed to sit up in bed twenty-four hours after the operation. If their temperature is not elevated, they may leave the bed on the third day. A great percentage of adults insist on leaving the bed twenty-four hours after the operation. If complications do not occur, the patient is allowed to leave the hospital on the seventh day.

Dressings.—The superficial dressing is changed daily up to the fifth day, when the first deep dressing is used. After the first deep dressing, the patient does not need further outside dressing and bandage, and thereafter the mastoid wound is dressed every other day until completely healed.

Epithelization of the Posterior Wall of the Canal.—After granulations fill the mastoid cavity and reach the margins of the opening in the posterior wall of the canal, epithelization takes place, and the entire wound becomes covered with skin, making it nearly impossible to recognize the occurrence of surgical intervention.

SURGICAL ADVANTAGES OF SIMPLE SUBCORTICAL MASTOIDECTOMY

1. The aditus and antrum are reached with much greater ease through the superoposterior wall of the canal than through the outer mastoid cortex. As posterior drainage of the vault is the main objective of mastoidectomy, the advantage of exposing and cleaning out the aditus and antrum as the initial step of the subcortical mastoidectomy can readily be understood. Posterior drainage of the vault is therefore guaranteed and assured by this new method of approach.

2. Whether or not the level of the tegmen tympani is unusually low or high in its relation to the mastoid process should not be a source of worry to the surgeon, as with this new method of approach the aditus is immediately entered as the first step of the operation, and thus the lower limit of the middle fossa is immediately determined by the roof of the aditus.

3. The external semicircular canal is exposed early in the operation before the mastoid cells have been exenterated, and by designating the

limits of safety for the intelligent use of the curet and by guiding the direction of curettage, it becomes the keystone of the operation.

4. As it is known that the facial bend lies beneath the floor of the aditus, injury to the facial nerve is easily avoided by using the external semicircular canal as guide.

5. The incus is not in danger of being dislocated, for the surgeon is constantly curetting in a direction away from or posterior to the incus. With the old method of approach, the incus would be dislocated occasionally, because the surgeon was curetting toward and anterior to the incus.

6. Accidental injuries to the lateral sinus are reduced to a minimum, for the following reasons: (*a*) The sinus is situated anatomically much further from the posterior wall of the canal or the anterior wall of the mastoid cortex than from the outer wall of the mastoid cortex. (*b*) Since in the process of exenteration of cells, the surgeon curets from before backward, the operation is at an end, and all the cells have been exenterated by the time the sinus is exposed. If the sinus should then be injured, the surgeon can pack the wound and not worry about subsequent danger of infection, because he has completed the operation before injury to the sinus has occurred.

7. Since the subcortical mastoidectomy is a burr and curet operation, it does away with the hammer and chisel; thus the amount of trauma and shock is reduced to a minimum. Therefore, if there is any truth to the theory that the Gradenigo syndrome is sometimes the result of the trauma caused by the hammer and chisel, the subcortical method eliminates that danger.

8. The tympanic membrane, no matter how bulgy before operation, becomes flat immediately on completion of the operation. The reason for this is the fact that when the skin lining the posterior wall of the canal is incised and removed, the tension behind the drum is greatly relieved, because the outer layer of the tympanic membrane is a continuation of the skin lining the posterior wall of the canal.

Subcortical mastoidectomy is of advantage to the patient as shown in the following paragraphs.

Prevention of Secondary or Recurrent Mastoiditis.—It is the common experience of aurists that a certain percentage of patients, especially children, have secondary or recurrent infections of the mastoid process regardless of the thoroughness with which these mastoidectomies may have been performed. Children often have repeated attacks of purulent otitis media caused by some pathologic condition in the nasopharynx which is often difficult to correct. The connective tissues filling the mastoid cavity in the line of incision in back of the ear form a favorable nidus for infection, leading to recurrence of mastoiditis. This condition requires a secondary operation for its cure, with subsequent mastoid dressings, thus incapacitating the patient again for weeks and often months.

When subcortical mastoidectomy is performed, secondary or recurrent mastoiditis will be avoided for the following reasons: (*a*) A postauricular incision was not made in the skin; therefore there is no postoperative scar to lower the skin's resistance. (*b*) Periosteum was not destroyed. (*c*) The outer thick wall of the mastoid cortex was left intact, thus forming a barrier to infection. (*d*) The anterior wall of the mastoid cortex, which formerly formed the posterior bony wall of the canal, is absent. (*e*) The aditus is separated from the external auditory canal by a thin epitheliated wall instead of its former bony wall. Since nature always takes the course of least resistance, it is only fair to reason that in cases of severe infections of the middle ear in patients who have undergone a subcortical mastoidectomy, it will again take the course of least resistance and inflame the thin epitheliated wall separating the aditus from the external auditory canal. One of my patients on whom I performed a subcortical mastoidectomy confirmed this view by developing a purulent otitis media six months after the operation, which ruptured through the posterior wall of the canal in the region corresponding to the aditus; it emptied itself and closed ten days later without surgical intervention.

Hearing.—Hearing becomes normal following subcortical mastoidectomy. In comparing a series of consecutive cases of postoperative mastoidectomies performed by the Schwartze method with an equal consecutive series of subcortical mastoidectomies, the hearing was found to be better following the latter. The only possible explanation for this is the fact that bone conduction was maintained, owing to the preservation of the outer mastoid cortex.

Cosmetic Advantage.—The cosmetic advantage of the subcortical mastoidectomy is self-evident. (*a*) The often hideous mastoid scar is avoided; (*b*) no part of the auricle is sacrificed by this new procedure; (*c*) a visible incision is not made in any part of the auricle, and (*d*) the contour of the external auditory canal remains unchanged.

Postoperative Infections.—The occurrence of infections such as cellulitis of the scalp, erysipelas, cervical adenitis, torticollis and eczema of the skin is reduced to a minimum. Because a postauricular incision is not made in this new operation, and because the attachment of the sternocleidomastoid muscle to the tip is not severed, it is obvious that the aforementioned complications should be reduced to a minimum if not entirely prevented. As blood vessels are not clamped and therefore tissues are not crushed, there is no devitalized tissue to act as a medium for infection.

Convalescent Period.—The period of convalescence is markedly diminished. The patient is able to sit up in bed and move his head freely without pain soon after the operation. The reactions in temperature are much less frequent following this procedure. If the temperature is normal, the patient leaves the bed on the third postoperative day. This

sense of well-being is probably due to the slight amount of trauma to which he is subjected during the operation. The patient leaves the hospital on the seventh day after the operation in a better physical condition than did patients on whom the old method of operation had been used.

Shortening of the Healing Period.—The average healing period is five weeks. As the outer mastoid cortex, periosteum and skin are left untouched, the area to be granulated is smaller than that in the Schwartze operation.

Period of Disability.—As an outside mastoid dressing or bandage is not worn by the patient after the fifth day, a great nuisance is disposed of and the patient is enabled to pursue his daily activities. The period of incapacity is therefore materially shortened.

Prevention of Neuralgic Pain.—The fact that the sternocleidomastoid muscle does not have to be sacrificed prevents neuralgic pain, which occasionally has been observed following the so-called classic operation; in these instances, the pain has occurred in the areas behind the ear and has extended up into the scalp, in some instances as far as the vertex. This pain is due to injury of the superficial network of nerves formed by the mastoid branch of the great auricular and small occipital nerves.

SUMMARY

One hundred and sixty-five subcortical mastoidectomies were performed in cases of acute suppurative mastoiditis.

A general anesthetic was administered in 163 cases. In one case of acute suppurative mastoiditis, in a young man, aged 26, suffering from tuberculosis of both lungs, a local anesthetic was employed. In a case of Bezold's abscess in a man, aged 40, who was suffering from diabetes, the patient was operated on under local anesthesia after his blood sugar had been reduced to normal with insulin.

Roentgen-ray examination was made in every one of the 165 cases before subcortical mastoidectomy was performed. The object of roentgenography in every case was twofold: (1) to help confirm the diagnosis of acute suppurative mastoiditis made clinically and (2) to complete the records kept in all cases, in spite of the fact that the diagnosis of acute suppurative mastoiditis was obvious both from the clinical and from the pathologic pictures.

Roentgen-ray knowledge of the mastoid process with respect to the kind and extent of the cellular structure is not necessary for the successful performance of subcortical mastoidectomy.

These cases may be classified as follows:

One hundred and sixteen cases of acute suppurative mastoditis representing various degrees of cell destruction within the central chamber of the mastoid process.

Nineteen cases of subperiosteal abscess with perforation of the outer wall of the mastoid cortex in the region of the antrum.

One case of subperiosteal abscess in a child, aged 3 years, without history of discharge from the middle ear. Examination of the fundus revealed a bulging drum membrane without evidence that a perforation had existed. Cortical perforation was found over the antrum.

One case of postauricular edema with a history of infection of the middle ear existing for five weeks. Discharge from the middle ear was profuse and thick. The tympanic membrane was bulging, and the posterior canal wall was swollen. Subcortical mastoidectomy was performed. A cortical perforation was not found. The pathologic mastoid process was not extensive enough to account for the clinical picture.

Three cases of acute suppurative mastoiditis presenting perforation of the zygoma.

Two cases of Bezold's abscess.

Twelve cases of perisinus abscess. In two cases, the clinical diagnosis of perisinus abscess was made before the operation.

Three cases of acute suppurative mastoiditis complicated by acute perilabyrinthitis.

Two cases of acute suppurative mastoiditis complicated by acute suppurative labyrinthitis.

Two cases of acute suppurative mastoiditis complicated by Gradenigo's syndrome.

One case of acute suppurative mastoiditis in which an epidural abscess was found.

Two cases of acute suppurative mastoiditis complicated by sinus thrombosis at the time when the patients presented themselves for operation at the Lempert Hospital.

One case of acute suppurative mastoiditis with a perforation through the bony wall of the posterior canal.

Of the 165 patients operated on, the dura was exposed in 27 cases, the sinus in 36 cases and both sinus and dura in 18 cases.

BACTERIOLOGY

Cultures of pus obtained from the mastoid process in the 165 cases revealed the following:

Streptococcus hemolyticus was grown on culture in 125 of the cases in which operation was performed; *Streptococcus mucosus* in 4; *Streptococcus anhemolyticus* in 16; *Streptococcus aureus* in 8, and diphtheroids in 10; growth did not occur in two cases.

COMPLICATIONS ENCOUNTERED

In 158 of the 165 patients with acute suppurative mastoiditis operated on by the subcortical method, the disease ran an uncomplicated course.

Three patients were operated on for sinus thrombosis, two of whom had sinus thrombosis when first admitted to the hospital. A simple subcortical mastoidectomy was performed first, and a blood culture was taken in both cases. A positive culture of *Streptococcus hemolyticus* was obtained in both cases. In one case, that of a girl, aged 12, the jugular vein was ligated two days after the subcortical mastoidectomy was performed. In the other case, that of a boy, aged 19, the jugular vein was ligated four days after the mastoidectomy. The third case of sinus

thrombosis in a girl, aged 19, was a complication occurring ten days after subcortical mastoidectomy was performed. At the time of the operation for acute suppurative mastoiditis, a perisinus abscess was found. A positive blood culture of *Streptococcus hemolyticus* was obtained. The patient developed a psoas abscess as a complication following the ligation of the jugular vein.

The lateral sinus was exposed throughout its entire length, incised, the clot removed, free circulation established and packing inserted through the original opening in the posterior wall of the canal. A postauricular incision was not made, and the outer wall of the mastoid cortex was left intact. The technic of the operation for sinus thrombosis with a full report of the cases in which an operation was performed will be given in a future communication.

In one case of acute suppurative mastoiditis accompanied by Gradenigo's syndrome in a man, aged 30, acute suppurative meningitis developed two weeks after simple subcortical mastoidectomy was performed.

In one case of acute suppurative mastoiditis in a man, aged 21, which was complicated by acute suppurative labyrinthitis, when first seen by me a simple subcortical mastoidectomy was performed. Two weeks after the operation, the patient developed symptoms suggesting the presence of a cerebellar abscess. The cerebellum was explored, but an abscess was not found. He later developed acute suppurative meningitis. The germ isolated was *Streptococcus hemolyticus*.

Such complications as erysipelas, cervical adenitis, cellulitis of the scalp, torticollis and eczema were conspicuous by their absence.

One patient, a child, 18 months old, developed septic lobar pneumonia three days after operation and a subsequent empyema.

One patient developed bronchopneumonia.

RESULTS

The two patients who developed acute suppurative meningitis died.

The remaining 163 of the 165 patients operated on made a perfect recovery.

One hundred and fifty-eight patients were discharged from the hospital in from six to seven days after the operation.

One patient with sinus thrombosis was discharged after four weeks and another after three weeks, whereas the third patient, who developed a psoas abscess for which operation was performed, remained in the hospital twelve weeks.

The patient who had bronchopneumonia was discharged at the end of three weeks.

The child with septic pneumonia complicated by empyema for which it was operated on was discharged from the hospital at the end of six weeks.

Of the 163 patients who recovered, the middle ear was dry when the first deep dressing was performed in 157 cases. In six cases, the middle ear became dry in a period of from two to three weeks after the operation.

The period of healing varied from three to eight weeks; the average time was five weeks.

In 162 patients hearing returned to the patients' normal. One patient who had acute suppurative labyrinthitis accompanying mastoiditis remained totally deaf in that ear.

In the 165 patients operated on, there has not been a single recurrence to date.

COMPLICATIONS AND RESULTS IN THE LAST ONE HUNDRED AND SIXTY-FIVE CASES OF SCHWARTZE MASTOIDECTOMIES PERFORMED BY THE AUTHOR

In comparing the complications and results in the 165 cases of acute suppurative mastoiditis in which simple subcortical mastoidectomy was performed with those of a series of the last 165 consecutive cases of acute suppurative mastoiditis in which the patients were operated on by the established method of Schwartze, the following is revealed:

Complications.—In the last 165 cases in which the Schwartze mastoidectomy was performed, 5 patients developed sinus thrombosis as a complication; 4, erysipelas and 16, cervical adenitis. In 3 cases cellulitis of the scalp followed; in 1 case torticollis which lasted nine weeks; in 8 cases, eczema of the skin surrounding the postauricular incision and in 5 cases, acute suppurative meningitis.

Results.—Two of the five patients operated on for sinus thrombosis died. All of the five patients that developed acute suppurative meningitis as a complication died. The remaining 158 patients recovered.

The middle ear was dry within a period of about two weeks, except in fourteen cases in which the middle ear remained wet for about four weeks. The healing period varied from six weeks to three months; the average healing period was about eight weeks.

Though the hearing was good after the Schwartze operation, the average hearing was not so good as that following the use of the subcortical method.

Six of the last 165 patients on whom Schwartze mastoidectomies had been performed presented themselves at the Lempert Hospital during a period of less than one year after the operation with recurrent mastoiditis following an attack of otitis media purulenta acuta.

COMMENT ON COMPARATIVE RESULTS

In comparing the number of intracranial complications and the number of deaths encountered in a series of 165 cases after simple subcortical mastoidectomy with those following Schwartze mastoidectomies in a

series of the same number of cases, I do not wish to establish a claim that the frequency of intracranial complications or the rate of mortality is decreased by the use of the subcortical operation, but rather to emphasize the fact that the frequency of intracranial complications and the death rate is not increased by subcortical mastoidectomy.

CONCLUSIONS

1. A much larger exposure than is generally believed can be obtained through the posterior bony wall of the canal.

2. A thorough exenteration of all the mastoid cells within the mastoid process can be accomplished with ease through the new method of approach described.

3. Every part of the mastoid structure can be seen without difficulty by this new method of approach, and thorough exenteration of all the cells, no matter how far removed they may be from the opening in the posterior wall of the canal, can be accomplished under direct vision.

4. It is not necessary to destroy a thick, healthy outer mastoid cortex in order to perform a thorough mastoidectomy.

5. With a thorough understanding of the anatomy of the mastoid process, subcortical mastoidectomy is a much neater and safer operative procedure than the Schwartze operation.

6. There is less sacrifice of healthy tissues when the subcortical operation is performed than when the old established operation is used.

7. If secondary or recurrent mastoiditis could be eliminated by the adoption of subcortical mastoidectomy, which is a logical assumption, it should certainly be the operation of choice in acute suppurative mastoiditis.

8. In this age of cosmetic surgery, the fact that the postauricular incision with the often hideous scar resulting therefrom is done away with by this new procedure is worthy of consideration by the otologist.

9. The variety of pathologic conditions dealt with in the 165 cases and the results obtained therefrom prove that subcortical mastoidectomy is not an operation to be used in a few selected cases but one applicable in all cases requiring operation on the mastoid or for any complications resulting from disease of the mastoid process.

10. After having performed 1,500 mastoidectomies with the old established Schwartze method, and after a careful, impartial and critical study of the subcortical method and its gratifying results to both surgeon and patient, I was so thoroughly convinced of its superiority that I ceased performing the Schwartze operation and now employ only subcortical mastoidectomy.

NONOPAQUE FOREIGN BODIES IN THE ESOPHAGUS AND ESOPHAGOTRACHEAL FISTULA

THEIR DEMONSTRATION BY INGESTED IODIZED OIL *

SAMUEL IGLAUER, M.D.
CINCINNATI

Before making a search for a suspected foreign body in the esophagus, it is always advisable to employ the roentgen ray as an aid to diagnosis. A radiopaque foreign body of any size is usually easily demonstrable, but nonopaque bodies present certain difficulties. The usual technic in demonstrating the presence of nonopaque bodies is to have the patient swallow barium in a suspension, or in a capsule which may become arrested above the intruder. In the subsequent search with the esophagoscope, the barium is frequently seen to form a pool above the foreign body, obscuring the latter. It requires considerable time and effort to remove the barium before the foreign body can be fully exposed to view.

Recently, I have employed iodized oil instead of barium in several cases to determine the presence of a nonopaque foreign body in the esophagus and have found that it has certain advantages which will be enumerated in describing the cases.

REPORT OF CASES

CASE 1.—*History.*—Mrs. R., aged 44, married and the mother of four children, was referred to me by Dr. Starr Ford, March 3, 1927. Her chief complaint was inability to swallow anything.

At the age of 21 months, she accidentally swallowed some homemade lye (wood-ash) after which she was very ill for months. All her life, she had had difficulty in swallowing. During the past ten years, on three or four occasions she had had almost complete stoppage in the esophagus. At the age of 8 she had typhoid fever, after which she had trouble with her eyes, and twelve years prior to coming to me she became entirely blind. Her usual diet consisted of vegetables and fruits. The present trouble began forty hours before I first saw her, while she was eating roast beef. Since that time she had been unable to swallow either liquid or solid food.

Examination.—The patient was given 20 cc. of iodized oil 40 per cent to swallow, and the act of deglutition was observed in the fluoroscope. The iodized oil was seen to collect in the esophagus about 2 inches (5 cm.) above the diaphragm, and the fluid did not enter the stomach. The reading of the roentgenogram by Dr. Sam Brown was as follows: "The esophagus presents an obstruction two inches above the cardiac end. The opaque medium presents

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* Read before the American Bronchoscopic Society, Atlantic City, N. J., May 21, 1927.

a concave lower border, apparently due to an impacted foreign body with a convex outline protruding upwards."

Operation.—Without either local or general anesthesia an esophagoscope was introduced, and the iodized oil was quickly removed, leaving the foreign body fully exposed. The latter consisted of an impacted plug of meat which was removed piecemeal. The stricture was then observed and found to be an annular cicatricial stenosis with a diameter about that of a lead pencil. The patient made an uninterrupted recovery.

Comment.—The picture was of value, as the usual coneshaped outline seen in cases of obstruction was found reversed, i. e., with the convexity directed upward instead of downward, indicating the presence of a foreign body impacted above the stenosis.

At esophagoscopy the iodized oil was removed with greater ease than would have been the case with ingested barium, thus immediately bringing the foreign body into view.

Case 2.—*History.*—A physician, the father of D. C., aged 3½ years, stated that the child had a habit of swallowing buttons. These had always passed by bowel without any difficulty.

On the afternoon of March 4, 1927, while playing with buttons, the boy suddenly got up, made a face as if swallowing with difficulty and then cried for five minutes. He did not have a choking spell. At the evening meal, while he was attempting to eat mashed potatoes and tapioca pudding, the food was regurgitated after he swallowed three mouthfuls. He was able to retain fluids, but not solids. There was no change during the two following days. At his home in Dayton, Ohio, the patient was given three or four swallows of a half strength barium meal, and the roentgenogram, taken one minute after the ingestion of the barium, failed to show the presence of a foreign body in the esophagus, all of the barium appearing in the stomach and duodenum. The patient was not observed with a fluoroscope.

Use of Iodized Oil.—The patient was brought to me two days after the onset of the symptoms. On admission to the hospital, his temperature was 99.4 F. He was given about 18 cc. of iodized oil 40 per cent to swallow and was observed under the fluoroscope. Viewed laterally, the iodized oil was seen to divide into two streams in the upper esophagus, one stream flowing in front of an island-like obstruction and the other behind the island. Roentgenograms showed some of the iodized oil opposite the third dorsal vertebra (fig. 1) outlining a flat foreign body transversely placed. In the center of the foreign body, a small circle, about one fourth of an inch in diameter, was observed. Within this circle several small dots were seen which were interpreted as thread holes in the button.

Operation.—Without anesthesia, the foreign body was removed by the aid of an upper-end esophagoscope and found to be a large, thick, triangular bone button. The patient's recovery was uneventful, except that a petechial rash appeared on the day after the iodized oil was given. The rash was quite definite and was distributed on the forehead and cheeks. It disappeared in about a week.

A roentgenogram of the button after its removal showed that the small circle and holes seen in the original picture were rendered prominent by the iodized oil which adhered in the crevices. After the button was immersed in ether to dissolve the iodized oil, the sharply outlined circles disappeared from the roentgenogram.

Comment.—In this case, iodized oil 40 per cent revealed the presence of a foreign body in the esophagus after the ingestion of a barium mixture had failed to demonstrate the presence of such a body. The adherent iodized oil partly outlined the foreign body and revealed something of its shape and nature. As the iodized oil was tasteless, the child swallowed it without objecting. The petechial rash may have been due to the ingested iodine but it did not cause any particular discomfort.

To obviate iodism in a recent case, I gave the patient a brominized oil, bromipin, 33⅓ per cent, instead of iodized oil, to show the presence

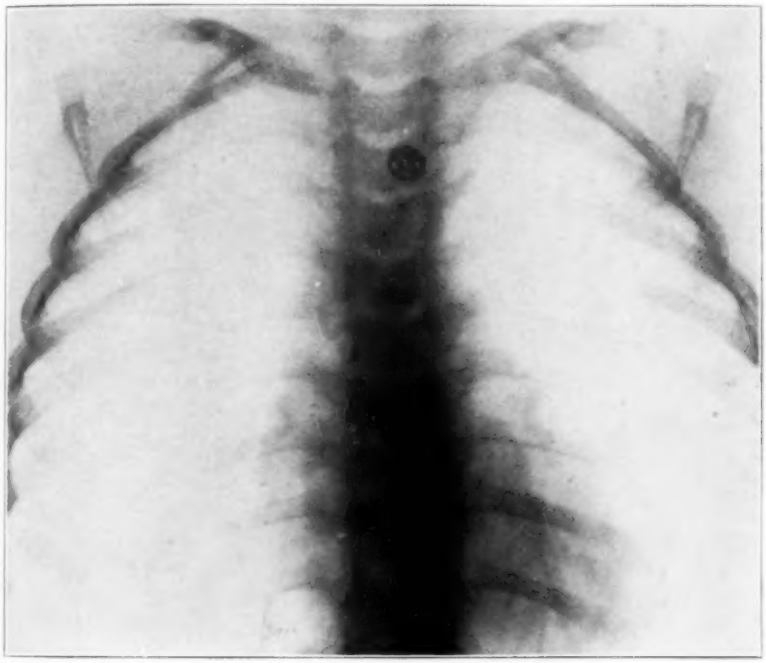

Fig. 1 (case 2).—Ingested iodized oil adhering to holes and crevices in a button which had been swallowed by the patient. Barium had failed to show the foreign body.

of a foreign body (fig. 2) and found that the brominized oil, which is nontoxic, may be substituted for the iodized oil.[1]

Case 3.—*History.*—Henry S., colored, aged 45, was referred to me for examination by the medical service of the Cincinnati General Hospital, with the diagnosis of esophagotracheal fistula. This diagnosis had been established when the patient swallowed a barium meal, some of which entered the trachea

1. Rad, Alex: Die Fülling d. Bronchial-baumes m. Jodölin u. Bromipin, Wien. klin. Wchnschr. **36**:1011, 1926. Dyroff, R.: Contrastol, ein neurer Kontrast-Mittel für die Darstellung Engkalibrigen Hohlraume, Deutsche med. Wchnschr. **52**:397 (March 5) 1926.

and bronchi by way of the esophagus. However, the exact site of the fistula had not been demonstrated.

Examination.—The left vocal cord was paralyzed and in the midline. Under local anesthesia applied to the trachea, a bronchoscope was introduced. Nine inches from the incisor teeth, the trachea showed a nodular mass on the posterior wall, partially obstructing the lumen. The mass bled on contact with the bronchoscope. A small nodule became detached, and one was obtained for microscopic study. The esophagus at the same level showed a nodular ulcerative mass on the right anterior wall. It also bled easily. A detached piece was taken for study.

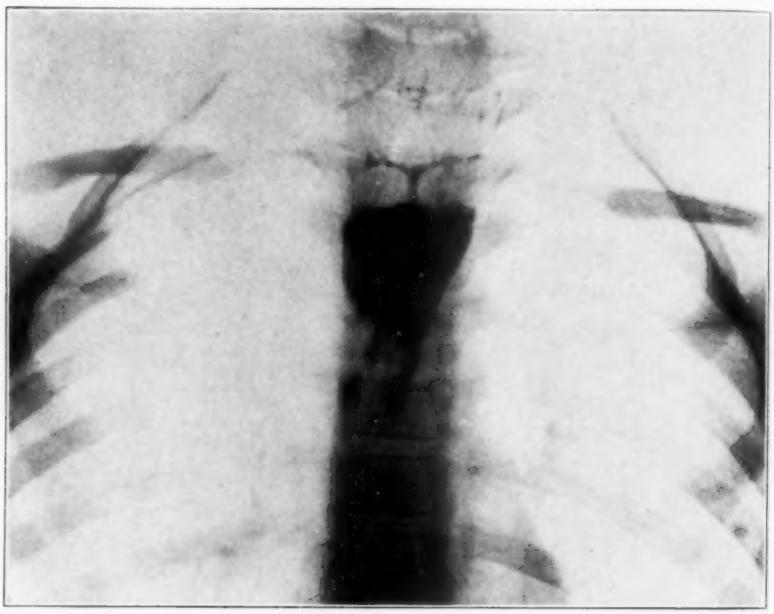

Fig. 2.—Ingested bromipin arrested above and about a foreign body, a sausage skin, impacted in a strictured esophagus, occurring in a boy, aged 9 years.

Diagnosis.—The condition was diagnosed as carcinoma of the esophagus eroding into the trachea. The fistula could not be seen either in the trachea or in the esophagus. A cotton tampon with a long string attached was inserted into the esophagus below the tumor mass, and the esophagoscope was withdrawn, leaving the string protruding from the mouth. The patient then swallowed iodized oil 40 per cent, and in the fluoroscope it was seen to pass from the esophagus into the trachea and bronchi, by way of a connecting fistula.

Roentgen-Ray Report (Dr. G. Benzing).—The roentgen-ray report read: "Reexamination of the previously described esophagotracheal fistula by the ingestion of lipiodol after the plugging of the esophagus below the site of the fistula demonstrates a distinct connection between the esophagus and trachea with lipiodol in both bases of the lung field. The tampon was then withdrawn by pulling on the string."

Operation.—A gastrostomy was performed. The patient died about ten days later. At necropsy, an esophagotracheal fistula was found.

Comment.—By plugging the esophagus below the fistula and having the patient swallow iodized oil, a distinct connection between the esophagus and the trachea could be visualized to better advantage than by the usual technic with barium. In a suspected case of esophagotracheal fistula, it is preferable to employ iodized oil 40 per cent because the entrance of iodized oil (or bromipin) into the bronchi does not cause any ill effects to the patient.

400 Pearl Market Bank Bldg., 707 Race St.

STANDARDIZING THE TUNING FORK

DOUGLAS MACFARLAN, M.D.
PHILADELPHIA

No one will deny that there is a demand for the standardization of the hearing tests when the unusual amount of literature that has appeared on the subject within the last few years is brought to mind. The day eventually will come when there are standards for hearing tests that are as useful and as familiar as those of the ophthalmologist. With the testing of vision, the standardization commenced in 1647, when Robert Hooke fixed the visual angle as one minute of the arc. "This being the smallest angle at which the average human eye could just distinguish double stars in and on to see them as two points or two stars. This angle is accepted to this day as the standard by ophthalmologists" (Spengler [1]).

It seems that in the matter of hearing, a standard unit must demand a single tone or single tones of known pitch and intensity that have been tested to hearing under standard, fixed testing conditions. These tests should, as far as possible, avoid calling on the more complex interpretive spheres, for an attempt is being made to test the peripheral factors in hearing. Causes for variation in the standard test should be defined and emphasized. At present, tuning forks alone appear as the most practical instruments on which to build up a standard. Forks give the purest single tones; they are fixed as to pitch; can they be reasonably controlled as to amplitude? If so, it is possible by a knowledge of the dampening factor of the fork to determine the exact amount of loss of hearing of a patient. With any given tuning fork which is struck a standard blow, a normal hearing time can be obtained by the examination of a large series of persons whose hearing is normal. The variation of age, intelligence, alertness, attention, and the like, has to be continually kept in mind. The patient's hearing is referred to the normal hearing time of the fork as a ratio, not as a fraction, for the relations are logarithmic, and the declination of the fork due to the dampening factor is not arithmetically uniform. With logarithms the figures can be reduced to percentage of hearing. When the factors for the fork are obtained, it is a matter of the simplest multiplication, as will be shown later in the paper.

It is presumed that the one blow hearing-time method is, for many obvious reasons, preferable to the method of using the forks by the distance-hearing method. If so, a standard blow must be selected.

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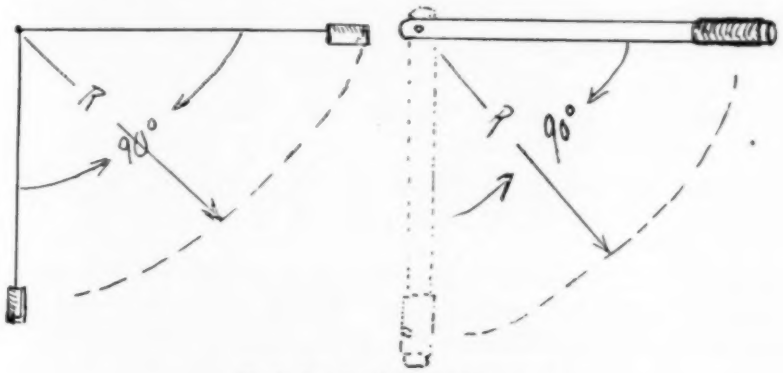
1. Spengler, J. A.: J. Ophth. Otol. & Laryngol. **28**:322, 1924.

DESCRIPTION OF METHOD

In 1922, I [2] described the first instrument of the pleximeter type that I used. It was a steel wire suspended from a gallows arm and allowed to swing and to strike like a pendulum. Subsequently, other types have been experimented with, a 10 Gm. weight on a catgut cord being used. There was a metal spool which would allow any length of cord to be let out. The strings were always too elastic and the striking direction was uncertain, so the stiff pleximeter was readopted. This has now evolved into a brass rod, 8¾ inches long by 3/16 inch square, having rubber tubing on one end. The rod is allowed to swing from a horizontal to a perpendicular position when it strikes the fork near its extremity. As it strikes it rebounds, and the vibrating fork is withdrawn for the testing.



Technic of using pleximeter.

That the force of the blow is directly proportional to the radius is shown by the following explanation of the accompanying illustration:

Energy of blow equals $\frac{1}{2} MV^2$ (when M is mass, and V velocity at the moment of impact).

But V is the same as velocity attained if weight had fallen freely through height R. Whence, V equals the square root of $2gR$ (in which g is the acceleration due to gravity).

Hence energy of blow equals $\frac{1}{2} M(\sqrt{2gR})^2$ equals MgR.

From which it is seen that the blow for radius R_1 is to blow for radius R as

$$\frac{MgR_1}{MgR} = \frac{R_1}{R}$$

Or, in other words, force of blow is directly proportional to radius.[3]

2. Macfarlan: J. Ophth. Otol. & Laryngol., 1922.

3. Further mathematics on the determination of the dampening factor are given in Grant, Dundas: Proc. Ninth Internat. Oto. Congr., Boston, 1916; Fletcher, Harvey: Paper presented before Otological Society Meeting, Washington, D. C., 1925.

The technic of using the pleximeter is not varied, and the pendulum is always started from the horizontal and allowed to strike the fork when the rod reaches the perpendicular. Here, then, is a standard blow.

The results obtained with this standard blow may be illustrated briefly by the following figures. Here two forks were used: the first, a Koenig B 488 double vibration fork; the second, a C 256 double vibration fork made by the Standard Scientific Co. For comparison, there is added a table showing results obtained with the knee-blow; the independability of the latter is obvious. The figures represent seconds of hearing; the same person with normal hearing was used throughout for the tests.

B488	BC	30,	30,	30,	30,	30,	30,	30,	30,	25,	30
	AC	60,	60,	60,	60,	60,	60,	60,	60,	55,	60
C256	BC	60,	60,	60,	60						
	AC	120,	120,	120,	120						

With the knee-blow:

B488	BC	32,	28,	28,	30						
	AC	62,	60,	60,	45						
C256	BC	65,	37,	50,	70,	60,	60,	90,	55,	65,	110, 60
	AC	125,	90,	110,	163,	120,	160,	195,	150,	125,	180, 160

In regard to the knee-blow, the conclusions are that the fork cannot be struck a repeatedly identical blow. The conformation of the knee varies with different examiners; the clothing on the knee introduces a variable; it is impossible to strike the same knee repeatedly on the same place and to strike the fork on the same spot.

The fork recommended for routine testing of time-hearing is one of the relatively low pitches, 256 or 512 double vibrations, for it is only with these low forks that there is obtained a hearing-time sufficiently long for practical timing purposes. These forks will individually vary as to their normal hearing time, so that each has its own normal. Several years ago, I tried to find a fork with the ideal Alexander timing of 110 seconds *AC*, 70 seconds *BC*, but in timing a great many forks, none was found. The Riverbank Laboratories, Geneva, Ill., an endowed research institute, has recently invented a magnesium fork of light weight and with recorded dampening factor. A description of this fork was presented before the Otological Society by Dr. Sonnenschein in 1926. With forks of a hearing time longer than 120 seconds *AC*, the end-point of hearing is not distinct and the factor of auditory fatigue is liable to intervene.

To use the time fork to determine the percentage of hearing for the pitch used, it is necessary to know the dampening factor of the

fork. This dampening factor may be described as the rate of "dying down" of the fork, which rate is not an even arithmetical declination but a sudden initial drop, followed by a more gradual geometric decline. "This declination is different in various forks of the same pitch, but is practically the same for any one fork, unless there is a great variation in the intensity with which the fork is struck" (Sonnenschein).

The factor is designated by physicists with the Greek sign "delta." All computations of hearing time have to be multiplied by this factor. If a fork can be normally heard for sixty seconds, and if a person who is hard of hearing hears it for only thirty seconds, the hearing loss (H. L.) is not one half, but is the difference in time multiplied by delta, the fork's factor of dampening.

H. L. $= \Delta\ (t\text{-}t_1)$, in which t represents the normal hearing time, and t_1, the patient's hearing time.

SENSATION UNITS

"It is a psychological fact that the sensation increase produced when sound intensity changes from 100 to 1,000 is the same as when it changes from 1 to 10." Equal steps of increasing loudness of sound, as they appear to the listener, actually represent sound force that is increasing at each step, ten times that of the preceding step. It is for this reason that Fletcher has proposed that hearing be measured by units, called sensation units. One of these sensation units corresponds to a fractional change in the intensity, which is approximately the smallest that the average ear can detect.

The hearing loss (H. L.) in sensation units is defined mathematically by the equation

$$\text{H. L.}\ldots\ldots 10 \log \frac{1}{1_0}$$

where 1 and 1_0 are the intensities which the sound must have to be just audible to the person being tested, and to a person of normal hearing respectively.

To reduce the results of tests with the fork to percentages of hearing loss, the following formula is used:

$$\%\ \text{H. L.}\ldots\ldots K\,\Delta\ (t\text{-}t_1)$$

In this instance, K is a constant for the various pitches of forks, and bears relation to the varying audibility to different pitches with varying types of sound (forks, voice, monochord, audiometers, etc.)

128.... 1.09
256.... 0.91
512.... 0.79
1024.... 0.76
2048.... 0.77

Last year, through the cooperation of Dr. Phillips, I obtained the consent of the Bureau of Standards to determine the dampening factor and the true pitch of all forks submitted to them. The charge set at that time was nominal, $2.00.

With the standard fork blow, with surveyed forks and with an identical technic in making examinations, the opportunity for definite, intelligible testing is within the reach of every otologist.

1805 Chestnut Street.

PERITONSILLAR INFECTION

SAMUEL D. GREENFIELD, M.D.
BROOKLYN

Under ordinary conditions, peritonsillar infection is a fairly common disease. Aside from being a most distressing and painful malady at times, it has come to be considered more or less benign and self-limiting in its reaction, rarely giving rise to any serious local or more general systemic complications. One recalls few such local acute infections, however, in which suffering is more intense and which in so short a time will exhaust and weaken the patient and render him helpless to such an extent as does severe peritonsillar infection. This is especially apparent in patients in whom bilateral involvement occurs. Due to the fact that the condition is looked on as a simple process, it is placed in the category of minor ailments and usually is not accorded much concern. I shall endeavor, however, to call attention to the fact that peritonsillar infection at times may assume a most serious import, even to the extent of becoming a menace to life. From the standpoint of the patient, the pain and discomfort are not of small moment. When one considers that the condition from its inception to its termination, even in the so-called favorable cases, covers a period of from five to seven days, it immediately becomes evident that the ordeal in itself is most trying. From a perusal of the modern textbooks one is led to believe that local or general complications seldom or never occur. I fail to understand why peritonsillar infection is treated so lightly by most authors who devote little space to a discussion of this important subject. No less an authority than Trousseau is quoted as having said that he had never seen any one die of quinsy. In the majority of instances this is true. A review of the more recent literature, however, reveals a long series of complications of varied character following peritonsillar infection from which a number of persons have succumbed. It seems that the medical profession has become less reticent about reporting fatalities.

With a personal experience of approximately 290 cases, I have been able to make some interesting observations which I wish to record. In several instances, I was able to follow these patients over a period of years, so that I have seen recurrences in the same persons as many as four and five times. I have encountered a number of complications, some of a more serious nature; among these cases, one fatality occurred.

One can readily understand those distinctive features which characterize suppurative processes in this locality if the anatomic arrangement of the tonsil and the structures adjacent to it are considered briefly.

The faucial tonsil is a globular mass of lymphoid tissue situated in the tonsillar recess. This recess is limited anteriorly by the palatoglossus

muscle (anterior pillar), posteriorly by the palatopharyngous muscle (posterior pillar) and laterally or externally by the superior constrictor muscle of the pharynx. Immediately surrounding the enclosed portion of the tonsil is a layer of fibrous tissue, the tonsillar capsule. The latter is intimately connected with the aponeuroses of the muscles already described, being separated from them by a layer of loose areolar tissue. The triangular space formed above the tonsil by the junction of the anterior and posterior pillars is known as the supratonsillar space or fossa and contains an abundance of loose areolar tissue. In the majority of instances, the infection localizes here.

PATHOLOGY

It is agreed that peritonsillar abscess presupposes the presence of a bacterial infection in the tonsil proper or in a remnant of tonsillar tissue that has remained after an incomplete operation. In most cases, the infection spreads by way of the lymphatics of the loose areolar tissue in the immediate vicinity of the tonsillar capsule. In some instances, the infection localizes in the bottom of a tonsillar crypt and then ruptures the epithelial lining at the base of the crypt and so enters the tissues about the tonsil. When the infectious process has burrowed its way beyond the tonsils, its spread is limited by the direct resistance of the aponeuroses of the muscles surrounding the tonsil; the mesial surface of the latter, therefore, is the only portion exposed. The products of inflammation dissect the tonsil with its capsule from the tonsillar bed and push it toward the median line.

It is apparent, therefore, that pus in peritonsillar infection may select several sites about the tonsil in which to localize itself.

The following comments apply only to those cases in which previous peritonsillar infection which required incision and drainage has not occurred, for it will be readily understood that in these patients the formation of dense scar tissue in and about the tonsil follows the incision. Hence, when infection recurs, the spread of the inflammatory process along the natural lines that these infections usually follow will be interfered with. Consequently, the suppurative elements will be diverted to atypical locations and will cause atypical peritonsillar abscesses.

In the majority of cases and in those in which the typical form of peritonsillar abscess occurs, the pus finds its way into the supratonsillar fossa in which there is sufficient space for collection and expansion of the products of inflammation. The most striking and outstanding features in cases of this type are the marked swelling and edema of the soft palate to the extent that the tonsil is pushed downward and mesially, the latter often being almost completely hidden from view. One sees an angry red, bulging mass and the uvula is markedly enlarged and pushed beyond the median line in close apposition to the tonsil of

the unaffected side. I have seen several cases, however, in which pus was located in the supratonsillar fossa and yet there was little swelling of the soft palate.

In a second group of cases, the pus finds its way behind the tonsil and has a tendency to burrow downward. The displacement of the tonsil is mainly forward, little or moderate swelling occurring above the tonsil. The posterior pillar bulges notably, giving it a pronounced sausage-shaped appearance. It often requires forceful depression of the tongue in order to disclose this typical bulging of the lower part of the posterior pillar. The characteristic feature in these cases is great pain on swallowing. This dysphagia is noted early in the disease and apparently is out of all proportion to the local inflammatory conditions at this particular time. I have noted, furthermore, that in these cases the inability to open the mouth is less pronounced than in any other form of peritonsillar abscess. Even when the latter is fully developed, with manifest fluctuation, there may be only slight limitation of motion of the lower jaw. I conclude from this, therefore, that only in those instances in which the infection approaches the superior constrictor muscle of the pharynx to any extent, or in which the inflammation extends laterally to any degree, is there interference with opening of the mouth.

In the third group of cases the pus finds its way behind, and external or lateral to the tonsil. It is probable that in these cases the infectious process has gained entrance through a ruptured crypt at about the midpoint or lower pole of the tonsil. The process develops more slowly, and the progress of the disease is more tedious. The symptoms and clinical conditions point to a more deeply seated suppuration. The maximum swelling seems to be on a line corresponding to the median part of the tonsil and tends to approach the last molar tooth. Here again the most striking and outstanding feature in these patients is the marked inability to open the mouth. This trismus is noted early in the disease. Treatment in these cases, I believe, is most difficult as it is sometimes hard to localize the abscess cavity, and repeated incisions are required before the patient obtains relief.

Together with this form of peritonsillar abscess may be mentioned a type which is atypical and fortunately is observed rarely. It is one in which the pus burrows laterally and pierces the superior constrictor muscle of the pharynx and localizes in the pharyngomaxillary space. The pus is deep-seated and difficult to approach. It may burrow downward more easily from this locality and enter the mediastinum. The great vessels of the neck approach the abscess cavity more closely here than in any other form of infection, and hence are more easily implicated. It is probable that cases terminating fatally belong in this group.

Another form of infection which I consider atypical is the one known as paratonsillar abscess which originates in caries and impactions of the last molar tooth. The area between the insertion of the internal pterygoid muscle and the ascending ramus of the lower jaw is the site of predilection for pus to collect in cases of dental origin. The condition starts from a carious tooth and results in a limited phlegmonous periostitis. This collection of pus expands and pushes the internal pterygoid muscle against the superior constrictor muscle, which in turn displaces the tonsil toward the median line. These cases are confusing, and it is especially difficult to differentiate them from cases of true peritonsillar abscess in which the pus has migrated to the region external to the tonsil. The diagnosis, however, can be made if one will bear in mind that in paratonsillar abscess the history of preceding dental pain is always elicited. A periosteal inflammation of the ascending ramus of the lower jaw develops and gives rise to severe pain along the teeth. A feature which is characteristic is the marked inability of the patient to open the mouth. In these cases, if an incision is not made the abscess eventually ruptures above the last molar tooth.

Secondary infection of the tissues constituting the tonsillar bed is another form of paratonsillar infection which does not originate in the tonsil itself but which follows tonsillectomy. I have seen four such cases, all occurring in adults. It seems to me that they occur following operations with local anesthesia and might easily be explained as due to the introduction of infection with the tonsillar syringe. All these patients complain of undue pain during the second week of convalescence. Instead of the dysphagia growing less after operation, it becomes more intensified and is accompanied by radiating pain in the ear on the side of the infection.

In three cases, there was swelling and fluctuation in the posterior pillar, and in the fourth there was also involvement of the adjacent postpharyngeal wall. This patient, in addition, presented marked cervical glandular enlargement on the same side. In all these cases, incision and drainage brought prompt relief followed by uneventful recovery.

In the so-called atypical peritonsillar infections which I shall now describe, I refer particularly to those cases in which pus does not localize in the areas mentioned in the foregoing paragraphs. As has been previously pointed out, the most common cause for this is the presence of dense scar tissue in and about the tonsil, resulting from previous incisions. When a number of attacks of tonsillitis have occurred followed by anterior incision, it seems that there is a special tendency for the pus to burrow downward and anteriorly in front of the tonsil, as the old scar offers resistance to the infection, preventing

the pus from following the usual upward course into the supratonsillar fossa. On the other hand, when the supratonsillar area has been incised deeply on previous occasions the pus may again show a predisposition to locate in the same region. The tonsil cannot be displaced in the classic direction owing to the resistance offered by the dense scar, and instead the suppurative elements burrow deeply and collect in the tissues behind the tonsil and external to it. When previous abscesses have required incision external to the tonsil, recurrent infection will have a tendency to cause the pus to migrate more laterally than before, owing to the presence of the scar, and will approach almost onto the last molar tooth.

I have noted cases in which the previous scars act as distinct partitions. Two and even three abscess cavities may result with a reinfection, all of which may require separate incision and drainage if the patient is to receive relief. On several occasions I have found pus in the posterior pillar and in the supratonsillar fossa external to an old scar, and both cavities have required incision. I have found a pus cavity in the supratonsillar fossa and one external to the tonsil on a plane one half-inch lower down. There is no question in my mind that atypical cases in which relief is not felt when pus is obtained are cases of this type, in which additional pus pockets exist and have not been located. One occasionally sees a recurrent peritonsillar abscess on the same side two or three days after there has been abeyance of the symptoms attributed to the primary abscess. I believe that these recurrences are often due to the original infection. One pus cavity has been incised, and the patient is relieved for a day or two; as the inflammation in another pus pocket matures, the symptoms accompanying the peritonsillar abscess recur.

Another atypical form of peritonsillar abscess is the so-called latent abscess. Local symptoms are not manifested in this type and I am sure that most laryngologists of even moderate experience have encountered such cases while performing tonsillectomy. I have seen several such cases. I especially recall three patients, one a laryngologist. All were adults, who suffered with rheumatic pains and who previous to operation did not present any throat symptoms. During operation, while the tonsil was being dissected, a sudden liberation of thick pus was noted which issued in varying amounts from the tissues immediately behind the tonsillar bed. At the time of preparation of these patients with the local anesthetic, nothing unusual was observed in regard to local manifestations or changes in the tissue.

Still another form of peritonsillar abscess is described by some writers[1]; it is atypical in that the usual symptoms of peritonsillar

1. Thiesen, C. J.: Ann. Otol. Rhin. & Laryng. **27**:600 (June) 1918.

abscess with edema and swelling of the soft tissues appear. The condition is of short duration and subsides spontaneously without incision. I am inclined to believe that these are cases in which suppuration takes place early and rapidly with spontaneous rupture of the abscess cavity, the latter slowly emptying itself and giving the patient relief. The site of the rupture is usually small, and for that reason it is overlooked; or its location is such as to make its detection difficult. This is especially true when the abscess perforates behind the tonsil or in the posterior pillar.

Bilateral peritonsillar abscess occurs occasionally and does not differ essentially from unilateral involvement. One side usually progresses more rapidly than the other, and often the symptoms resulting from the second side develop after the first abscess is well on the way to resolution. When the inflammation on both sides progresses simultaneously, the symptoms are more pronounced; especially is the obstruction to respiration more noticeable. It seems that bilateral involvement follows the more severe septic infection of the tonsil. It is not uncommon to note the presence of the septic membrane still visible on the tonsil even after the abscess cavity has been incised and drained. The duration of the disease in bilateral involvement is longer and convalescence is more prolonged, extending over several weeks.

It is agreed that peritonsillar abscess originates in a bacterial infection of the tonsil or its remnants. I have never seen a peritonsillar abscess in a patient in whom a complete tonsillectomy had been performed. Patients who are subject to recurrent tonsillitis manifest a predisposition to peritonsillar infection. It is especially notable that persons who have suffered one attack are prone to have peritonsillar abscess in succeeding years. It is often said that young children are immune to peritonsillar abscess; in general, this is true, but I have seen a number of typical peritonsillar abscesses in young children and even in infants. I have observed that peritonsillar abscesses follow the milder grades of tonsillitis as a rule rather than the more severe septic infections. The patient will often state that the preceding tonsillar infection was mild and hardly noticeable, but that only on localization of the pain to one side did the real illness begin. I have, however, noted that in most cases of bilateral peritonsillar abscess the preceding tonsillar infection has been of a severe type. On two occasions I have followed a streptococcic sore throat through its course to a development of a bilateral peritonsillar abscess.

The symptoms of peritonsillar abscess are fairly characteristic and require little discussion. One can readily appreciate, however, that their intensity will be influenced by certain factors, namely, the person, the virulence of the infection, the location of the pus, and lastly, whether or not the infection is recurrent. Thus a patient with a peritonsillar

abscess may not present any local manifestation of its presence (latent abscess); on the other hand, the clinical picture of peritonsillar abscess may be fully developed and extreme distress may be evident. The patient's expression is drawn and haggard; swallowing is exceedingly painful and at times, impossible. There is sharp, agonizing pain radiating to the ear and to the side of the head. Respiration is difficult, and the patient is in constant fear of suffocation. The mandible is more or less fixed. The tongue is coated, and the breath is foul; saliva dribbles from the mouth incessantly, and the patient is willing to submit to any measure in order to obtain relief.

Examination in early cases may reveal little more than evidences of the preexisting tonsillitis. At the end of from twenty-four to forty-eight hours, and especially coincident with the spread of the infection to the areolar tissues outside the capsule, the process becomes more rapid, and at this time the patient is aware of the existing pain and dysphagia. Examination now discloses dusky tissues with edema of the soft palate, and the tonsil is becoming displaced from its bed toward the median line. The uvula is no longer uninvolved and begins to approach the other side. The isthmus of the fauces is festooned with strings of ropy mucus, and the former is considerably narrowed by the bulging of the anterior pillar and adjacent soft palate. The lymphatic glands at the angle of the jaw are swollen and tender, while the entire side of the neck and the glands along the sternocleidomastoid muscle are painful.

The duration of the disease is from five to ten days. Relief comes only on spontaneous rupture of the abscess cavity or on adequate incision. Spontaneous rupture usually takes place through the tonsil into the supratonsillar fossa, through the anterior pillar and soft palate or through the posterior pillar. With rupture of the abscess cavity or drainage by incision, the general symptoms rapidly subside, and the local discomfort abates.

DIFFERENTIAL DIAGNOSIS

The diagnosis of peritonsillar abscess should offer little difficulty. During the first twenty-four hours, however, there may be nothing characteristic; at the end of that time, however, the typical appearance becomes evident, so that the condition is apparent even to the inexperienced. It is important for the general practitioner to examine the patient with good illumination in order to distinguish peritonsillar abscess from a number of conditions which, in a general way, present similar subjective and objective symptoms, namely, sore throat, dysphagia, elevation of temperature and cervical adenitis.

Briefly, peritonsillar abscess must be differentiated from the following conditions:

Retropharyngeal Abscess.—In young children and infants, the swelling on the postpharyngeal wall in retropharyngeal abscess may displace the tonsil and soft palate forward and to the median line. With the accompanying dysphagia, adenitis and temperature, a hurried examination might lead to a mistaken diagnosis. The one outstanding feature in retropharyngeal abscess, however, is the absence of inflammatory changes in the soft palate and tonsil. The latter is plainly visible and retains all its normal markings. A careful examination discloses the swelling behind the tonsil on the postpharyngeal wall. The latter is easily verified by digital examination.

Diphtheria.—Ordinarily there is little difficulty in differentiating peritonsillar abscess from pharyngeal diphtheria. In the so-called septic form of diphtheria, however, some difficulty may arise. In the latter condition, there is considerable cervical adenitis, and I have seen a unilateral swelling of the soft palate on two occasions which closely simulated peritonsillar abscess. In one instance, the diphtheritic membrane seemed limited to the tonsil, and the symptoms so closely resembled peritonsillar abscess that I incised the mass. To my surprise, however, even with such typical swelling and edema, I did not obtain pus. I then concluded I was dealing with diphtheria and administered antitoxin. The culture was positive for diphtheria. Untoward symptoms did not develop from the unnecessary incision.

Sarcoma of the Tonsil.—One is apt to feel that there should be no reason for mistaking sarcoma of the tonsil for peritonsillar abscess. After ulceration has taken place, there is no excuse for the mistake, but early in the condition such an error may be unavoidable. Ulceration of the surface is not an early symptom in sarcoma of the tonsil, and only enlargement of the tonsil and swelling of the soft palate with dysphagia and some glandular enlargement may be present at this stage. The case to which I am referring occurred in a boy, aged 13, a brother of one of the nurses in the hospital. The boy was brought to my office complaining of pain and dysphagia, and presented a moderate cervical adenitis. The soft palate was adematous and bulging. The tonsil was almost completely hidden. The portion still visible was covered with a grayish membrane closely resembling a streptococcus membrane. I incised the mass and found it hard and indurated. Pus could not be located, and the tissues bled considerably.. A culture made from the tonsil was subsequently reported negative for diphtheria. The patient was not relieved, but his condition did not seem to grow materially worse, even though the local picture seemed to progress. The adenitis, however, increased, and within two weeks the glands at the angle of the jaw became extensively involved. A section of the tonsil showed a mixed round spindle cell sarcoma.

Vincent's Angina.—The differential diagnosis here should offer little difficulty. I mention this condition because patients suffering with Vincent's angina have been referred to me with a diagnosis of peritonsillar abscess made by their physicians. The patient complains of unilateral pain and does not respond readily to treatment for tonsillitis; a possible peritonsillar infection is then suspected. A careful examination, of course, immediately rules out peritonsillar abscess.

COMPLICATIONS

Various complications, both local and general, may supervene on peritonsillar infection. Peritonsillar infection is a more or less simple process, self-limiting, with a tendency to resolve spontaneously. It is only the advent of some serious complication, however, that lends to the condition its vital importance.

Complications often are beyond the control of the surgeon, but I believe that by early diagnosis and timely operation the period of suffering for the patient may be curtailed, his convalescence shortened, and those complications avoided which result from retention and absorption and the continued contact of potent infectious products with vital structures.

One need but peruse the literature to be impressed immediately with the fact that complications occur in connection with peritonsillar infection. A great number of these, varied in nature, have been reported. I propose, however, to dwell at length only on those with which I have had personal experience, which are as follows: general sepsis, meningitis, one case, with death; hemorrhage, three cases, with recovery; acute laryngeal edema, one case, with recovery; cervical abscess, two cases, with recovery; polyarthritis, two cases, with recovery, and acute endocarditis, one case.

General Sepsis.—General sepsis is probably the most serious complication that may occur in connection with peritonsillar infection. Fortunately, it rarely occurs. It is surprising, however, that this complication is not seen more frequently when one considers that there is an infectious focus which, owing to the anatomy of this locality, has easy access to the circulation. Furthermore, in the course of the disease pus is found under tension in a part that cannot be put at rest. When this is considered together with the fact that so many of these infections are permitted to continue for a long period before drainage is instituted either by the physician or through spontaneous rupture, it is surprising that invasion of the circulation does not occur more often. I have previously called attention to the fact that in those cases peritonsillar abscess in which the pus burrows laterally and pierces the superior constrictor muscle to localize in the pharyngomaxillary space the more serious complications are prone to develop.

This clinical fact has been noted by other observers.[2] It seems that pus in this locality is difficult of approach. The suppuration is deep-seated, and drainage often is not well established. The course is prolonged, and complications resulting from absorption and retention therefore are more apt to follow. Woodson[3] pointed out that in intracranial complications the pus gains access to the cranium by way of the pharyngomaxillary space, the anatomy of which has been so well described in detail by Mosher. In a case reported by Wylie,[4] autopsy showed the course of the pus from the peritonsillar tissue to the pharyngomaxillary fossa. From here it was traced to an abscess in the prevertebral muscles, and thence to the base of the cranial fossa. Wessely[5] reported two such cases and demonstrated conclusively that the path of infection is as described in Wylie's case, e.g., from the tissues about the tonsil to the pharyngomaxillary space; from thence along the sheaths of the great vessels of the neck to the prevertebral structures and ultimately to the base of the brain.

History.—Peritonsillar abscess, cellulitis of the neck, sepsis, meningitis and death.

J. Mc., aged 34, was referred to me on Sept. 24, 1925, with a history of a sore throat of eight days' duration. Incisions had been made by two other physicians, the last one, forty-eight hours prior to my seeing him. He felt somewhat relieved after the first incision. Two days later, his symptoms again became more intense, and since then he had become progressively worse. The last incision did not give relief. At the time of my examination, I found the patient pale and exhausted, presenting all the signs of a well advanced peritonsillar infection.

Trismus was marked, and it was with great difficulty that I could get a view of his throat, which was markedly edematous. There was a large slough adjacent to the uvula, corresponding to the first incision. There was another more externally and a little lower down. The cervical glands were moderately enlarged and especially tender at the angle of the jaw. The temperature was 102 F.; the pulse rate, 110, and respiration, 32 and labored. After clearing his throat with suction I made a deep, wide incision external to the tonsil, one-half inch below the line joinng the uvula and last molar tooth. I did not obtain pus. I then turned my knife laterally and downward and cut in the direction of the attachment of the tongue, penetrating somewhat deeper. I encountered a large abscess cavity and evacuated a great deal of the most foul-smelling pus. The patient was immediately relieved, and the improvement in his condition was most striking. He returned to my offices the next morning. The glands in the neck were in about the same condition except that there seemed to be a few more that were palpable and tender, especially those lower down near the clavicle. The sternomastoid muscle was unduly sensitive along its course, and the patient had a typical torticollis. His general condition seemed a little better than on the previous day,

2. Thompson, St. Clair: Disease of the Nose and Throat, ed. 3, New York, D. Appleton and Company, 1927, p. 433.

3. Woodson, J.: South. Med. J. **19**:644 (Aug.) 1926.

4. Wylie, A.: Lancet **1**:178, 1919.

5. Wessley, E.: Intracranial Complications after Peritonsillitis, Ztschr. f. Hals-Nasun -u.Ohrenh. **9**:439, 1925; abstr. in Arch. Otolaryng. **1**:574 (May) 1925.

and the dysphagia appeared to be less severe. The temperature at this examination was 101 F., the pulse rate, 106, and respiration, 31. I urged hospitalization at this juncture, but the patient seemed disinclined to enter the hospital. Three days elapsed before I heard from him again, at which time I was notified that he was extremely ill. An examination at his home disclosed a very sick man. His temperature was 105 F.; the pulse rate, 140, and respiration, 44. He had had three distinct chills in the last thirty-six hours followed by profuse sweating. There was marked edema and induration over the entire lateral aspect of the neck and face, reaching from the clavicle to the forehead on the side of the original peritonsillar abscess. The neck was rigid, and he had a bilateral Kernig sign. He was delirious and had to be restrained. The patient was admitted to the Beth Moses Hospital on Sept. 28, 1925. On admission, a lumbar tap was performed, and 40 cc. of cloudy yellow fluid was withdrawn under extreme pressure. Results of examination of the fluid were subsequently reported as follows: 1,060 cells per cubic millimeter; differential count: polymorphonuclears, 100 per cent; albumin, 6 mm., reduction negative; white blood count 37,200 cells; polymorphonuclears, 89 per cent. A blood culture taken at the time of admission was subsequently reported positive. The organism isolated was the streptococcus. The patient died that same afternoon. Autopsy was not permitted.

Comment.—This case demonstrates conclusively that a simple peritonsillar infection may give rise to a more serious complication terminating in death. I believe that the pus in this patient migrated to the pharyngomaxillary space. This case seems to coincide with the two reported by Wessely.

Hemorrhage.—This complication is not so uncommon. There may be considerable bleeding at the primary incision, but as a rule this quickly ceases and does not cause concern. The hemorrhage that is apt to be accompanied by grave consequences is the secondary bleeding that sometimes unexpectedly occurs after the abscess has been incised. Serious bleeding may also occur in cases in which the abscess ruptures spontaneously.[6] A number of cases reported in the literature terminated fatally.[7]

Autopsies reveal that the blood in the cases may come from the internal carotid directly or from the lingual, facial or ascending pharyngeal, all branches of the external carotid. In view of the fact that hemorrhage in these cases usually occurs some time after the abscess has been incised, it is reasonable to conceive that the process must be one of infection, necrosis and erosion of the vessel wall due to its direct contact with the products of inflammation. It is apparent, therefore, that a good reason exists for early and timely incision of the collection of pus.

Three cases of profuse hemorrhage that I have encountered were all in female patients. Incision and drainage had been performed by me in two cases and in the third by another physician. Transfusion was required in all cases but I wish to report only one of the three. In this case, ligation of the common carotid was considered.

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6. Hutchinson, A. J.: J. Laryngol. Rhinol. & Otol. **34**:122, 1919.
7. Newcomb, J. C.: J. Laryng. & Otol. **23**:122, 1908.

C. C., aged 28, was referred to me on June 18, 1924, for profuse bleeding following incision of a peritonsillar abscess. Eleven days prior to my seeing the patient, bilateral sore throat began. This subsided in three days, and a day or so later she experienced pain in the left side of the throat. The pain became progressively worse, and while she was under the care of her physician a typical peritonsillar abscess continued to develop. The abscess was incised on June 16; the incision was ample, for she was immediately relieved. Her pain and discomfort was less and she was up and about, when suddenly, on the morning of June 18, without apparent reason, she began to bleed. She evidently had bled profusely, according to her physician. Examination did not disclose anything unusual about her throat. There was a clot where the incision had been made and she had ceased bleeding. Her pulse rate was 140. The hemorrhage had stopped, and since the patient's condition was not alarming, she was given some morphine, and an ice pack was applied to the neck. Nothing was done to her throat, however. Bleeding did not occur the remainder of the same day and all of the next day. The clot seemed to have shrunken considerably and appeared well organized. On the third day, however, she again had a recurrence of the bleeding, and this time I was present. The hemorrhage was profuse, and in all my experience I have never witnessed such an outpour of blood. There was no question but that it was coming from a large vessel. I packed the cavity tightly, and so controlled the bleeding. The patient was removed to the hospital on June 20, 1924. The hemoglobin content was 40 per cent, the red blood cells, 2,200,000. Ligation of the carotid artery was seriously considered. I decided that if she had another recurrence of the bleeding I would perform this operation; fortunately, this was unnecessary. Transfusion was performed on same day by the direct method, 500 cc. of blood being given. The next day the hemoglobin content was 55 per cent, and the red cells numbered 3,000,000. The packing was not interfered with until the third day, at which time one half of it was gently extracted. Bleeding did not recur, and the remainder of the packing was removed on the fourth day. She continued to improve, and bleeding did not recur. She was discharged from the hospital on July 2, 1924, well on the road to recovery.

Acute Edema of the Larynx.—True laryngeal edema occurs rarely as a complication of peritonsillar abscess. It is surprising, however, that this condition is not seen more often. It is notable that in the majority of instances there is some interference with respiration, the latter being commensurate with the amount of edema of the adjacent tissues. I have already mentioned that in bilateral peritonsillar involvement, the one outstanding symptom that seems especially to concern the patient is the interference with respiration. The obstruction in all these cases is not due to any actual edema of the glottis itself, but rather to the encroachment occasioned by the swelling of the surrounding tissues in the pharynx and hypopharynx. This is augmented by the collection and stasis of an abundance of thick tenacious mucus which always occurs in these cases. In patients in whom the embarrassment of respiration is marked, one can with some difficulty disclose edema of the tissues at the base of the tongue, including the glosso-epiglottic fold, even to an involvement of the arytenoid on that side. The edema and swelling may extend to the glottis and this is not an unusual

occurrence, for edema of the glottis is found associated with other phlegmonous conditions of the tissues adjacent to the glottis. Cases have been reported in which the edema of the glottis secondary to peritonsillar abscess has required tracheotomy. The case I am reporting occurred in an adult, and the interesting feature is the fact that the edema occurred after incision and drainage.

R. S., aged 54, was referred to me on June 18, 1927, with a history of a sore throat of three days' duration. He was a patient in whom I had incised peritonsillar abscesses for the past six years. Three years before this last infection, he had had a bilateral quinsy, and in 1926 I opened an abscess on the same side of the throat which was now affected. He had a great deal of scar tissue, and there seemed to be little bulging anteriorly. There was an area, however, which seemed to protrude more than the remaining anterior pillar. It was located somewhat laterally in the pharynx but medial to an old incision. I incised this area widely and obtained pus. The patient felt relief immediately. He returned the next day complaining of pain, and I found the lips of the wound closed. I inserted a pair of forceps into the cavity and evacuated an abundance of thin pus. In order to prevent a recurrence of this retention, I packed the cavity with some plain sterile gauze. This is not my usual custom, but in this case I felt it was indicated because the incision, which extended through dense scarred tissue, had a tendency to close. He was told to return the next day. About eighteen hours later, at 4 a. m., I was notified that the patient was very ill and was having difficulty with respiration. On arriving at his home, I found him sitting up, cyanotic and breathing with great difficulty. He was aphonic and in great distress. I immediately removed the packing and an enormous amount of serosanguineous fluid was discharged. He seemed to be relieved almost immediately. Examination of his glottis was difficult, but a view was obtainable after evacuation of the contents of the abscess cavity. I found the former almost twice its normal size. The question of tracheotomy came up, but after the patient was watched for some time, his condition became progressively better, and this operation was not considered. He made an uneventful recovery.

Comment.—I believe that this patient's edema was due to the packing I introduced for the purpose of draining the pus. Owing to the retention of secretions, a rapid and extensive edema developed. Cases of a similar nature, however, have been reported in which the edema followed incision and drainage when gauze was not used to maintain the patency of the incision.[8] I have never advocated packing and drainage, and I am now more strongly convinced than ever that introduction of gauze packing in these abscesses is not devoid of danger.

Cervical Adenitis with Suppuration.—Most patients suffering with peritonsillar infection present some sympathetic cervical adenitis. The gland most often involved is the so-called tonsillar lymph node located at the angle of the jaw.[9] As a rule, with incision and drainage of the abscess, the glands diminish in size, and the tenderness subsides. This

8. Stein, S.: M. J. & Rec. **121**:147 (Feb. 4) 1925.
9. Greenfield, S. D.: M. J. & Rec. **120**:383 (Oct. 15) 1924.

is not always the case, however, particularly in children. It seems that the amount of adenitis is commensurate with the length of time the process has existed before the pus is released. It appears that in young children with the appearance of softening of the cervical glands, the local symptoms in the throat seem to abate. These cases may continue for some time under a diagnosis of suppurative cervical adenitis, the physician waiting for the adenitis to soften sufficiently before resorting to drainage. In one of my patients, the adenitis was marked at the time of the incision of the peritonsillar abscess. The symptoms of the throat subsided entirely, but the glands progressed to softening and suppuration requiring incision about one week later.

The second case occurred in a child, aged 2, and is of interest because the child was referred to me with a diagnosis of suppurative cervical adenitis. The condition of the throat was entirely overlooked, for the child apparently never complained of pain there. I have previously called attention to the fact [10] that a unilateral cervical adenitis in many instances is suggestive of a collection of pus in the pharynx, most often retropharyngeal. Bearing this in mind, I examined the child and found a fully developed peritonsillar abscess. The condition of the throat may easily have been overlooked, as I have pointed out before in the so-called latent peritonsillar abscess or when the symptoms are very mild, especially in children. I incised both the peritonsillar abscess and the cervical glands at the same time, and the child made an uneventful recovery.

Polyarthritis.—It is not uncommon to find that an infectious arthritis has developed secondary to a peritonsillar abscess. One might expect the infection in these cases to be more potent in the production of conditions of the joint than the ordinary acute and chronic tonsillar infections. It is a conceded and well established clinical fact that in the majority of instances the tonsils act as the focus and portal of entrance in these cases of arthritis. Just as an acute tonsillitis superimposed on an already existing chronic cryptic tonsillitis may produce an acute arthritis, so may the advent of a peritonsillar abscess act as a direct etiologic factor. I have noted joint pains that became intensified in a number of patients who developed peritonsillar abscess. When these persons have had a low grade type of polyarthritis, an attack of peritonsillitis may precipitate an acute infectious arthritis. Crowe [11] has called attention to the fact that the patients most apt to develop the arthritides are those in whom the tonsils are small, fibrotic, and embedded with an abundance of scar tissue. This type of tonsil offers a suitable soil for the development of peritonsillar abscess. It is not surprising, therefore, that a peritonsillar abscess may convert a low grade arthritis into an acute infectious type. I have had occasion to note this complication in

10. Greenfield, S. D.: N. Y. M. J. **113**:604 (April 20) 1921.

11. Crowe; Watkins and Rothholz: Bull. Johns Hopkins Hosp. **28**:1 (Jan.) 1917.

two patients. They were both men, aged 32 and 39, respectively. One patient had suffered on two previous occasions with acute rheumatic fever. Following incision and drainage of the peritonsillar abscess, the patient developed an acute infectious arthritis of the right knee and ankle joints. The condition cleared up only after a prolonged convalescence. The second case also occurred in a person with so-called chronic rheumatism. He developed an acute involvement of both wrists, the right elbow and shoulder joints after incision and drainage of the abscess. It is three months since the onset of this patient's illness, and he is still suffering and unable to attend fully to his duties.

Acute Endocarditis.—I am calling attention to this condition for the purpose of stressing the importance of urging tonsillectomy in patients who have had attacks of quinsy. Such a tonsil is always a menace to a person, and at any time may be the starting point for a more serious complication. Not alone is the person more prone to the development of secondary peritonsillar infection, but the resulting scarred tissue has a tendency to bury further the diseased tonsil, rendering its drainage less advantageous and increasing its potency as an infectious focus. If the offending organism in the segregated portion of the tonsil is *Streptococcus viridans* or one of the streptococci that Rosenow has shown may have a specific affinity for certain organs, then a peritonsillar abscess may prove serious by a lighting up of this more or less dormant focus. With this comes the possibility of metastatic infections in these organs.

M. L., aged 15, was referred to me on March 8, 1927, with a typical fully developed peritonsillar abscess. A year previously I had incised an abscess in the same patient on the same side. At that time, I urged removal of his tonsils, after resolution had taken place. Unfortunately, my advice was not followed. At this time, I incised the abscess through the supratonsillar fossa and obtained an abundance of pus. The patient was immediately relieved, and I discharged him on the third day. Five days later, although the condition of the throat had entirely subsided, evidences of any more acute inflammatory signs not being present, the patient developed a high temperature and pains in his joints. Several days later, his joints became reddened and swollen and exceedingly painful. He first had involvement of the lower and then of the upper extremities. On the tenth day of his illness, evidences of an acute endocarditis appeared. He had presystolic and systolic murmurs. He had an eventful convalescence, being confined to bed for two months. All his joint symptoms subsided, but the condition of the heart remained the same. The last examination showed a definite mitral regurgitation and stenosis.

TREATMENT

From my observations in the treatment of patients with peritonsillar abscess, I have come to the conclusion that the well founded surgical principles governing treatment in suppurative conditions elsewhere apply in every detail to those occurring in the region about the tonsils. The tendency to wait until the pus is almost visible beneath the mucous

membrane is neither a humane nor a safe principle. Pus in most instances is always present in an appreciable amount on the third day, and there should not be any hesitancy in incising the abscess at this time. Owing to the painful and debilitating nature of the disease, early incision should be advocated. This should be urged all the more when one considers the fact that most of the complications arising in connection with peritonsillar abscess are directly or indirectly due to retention and absorption and the contact of products of inflammation with important and vital structures.

In general, it may be said that when a peritonsillar infection is established, it does not show any tendency to recede spontaneously. Therefore efforts should be directed toward hastening the progress of the suppurative process. This is best accomplished by the use of hot fomentations applied externally. Gargles are useless and extremely distressing. A great deal of comfort will be obtained by syringing the mouth and tonsillar region with warm alkaline solutions. The patient's strength must be conserved as much as possible, and pain should be relieved by the use of morphine in hypodermic injections. Catharsis and the administration of salicylates are also indicated.

I believe that one of the most important considerations in the treatment of patients who have peritonsillar infection is the selection of the site for opening the abscess. If one will bear in mind those pathologic peculiarities that I have called attention to, evacuation of the pus will be rendered less difficult, and the necessity of multiple incisions will be avoided.

When marked bulging is found in the supratonsillar fossa, one should look for pus above and anterior to the tonsil. The incision must be free and ample. I prefer making the latter in a vertical direction over the point of maximum swelling. Some physicians prefer the transverse incision, but I have not seen that this has any advantage over the vertical one.

In patients in whom inability to open the mouth is pronounced, the pus will usually be located more externally, and the incision should be directed laterally. In those cases particularly I follow the incision by the introduction of a pair of blunt pointed nasal forceps, which I open widely in the abscess cavity. This permits free evacuation of all the contents. The procedure may have to be repeated once or twice on successive days.

In those instances in which the pus descends into the posterior pillar, the latter must be incised before relief will be obtained. One will occasionally obtain pus in these cases by making the incision into the supratonsillar fossa. One should not be content with having located pus here, but should proceed to incise the posterior pillar in addition.

The procedure when an atypical peritonsillar abscess is present is a problem. Set rules cannot be made for these cases; each one must be considered individually, and the ingenuity of the surgeon is often taxed to the utmost. The symptoms and physical conditions at the time of examination will to a great extent determine the site of incision.

In cases in which pus appears to be present external to the tonsil, one should not hesitate to make an incision in this locality, even though it is necessary to cut through dense scar tissue. A procedure that seems to work exceedingly well in these cases is first to make an incision and then to insert a grooved director in the direction in which it is suspected that pus is present.

In those instances in which pus appears to be deep-seated and one suspects its presence in the pharyngomaxillary space, there should be little delay in incising the area. Deep and multiple incisions are often necessary if the pus cavity is to be located before further spread of the infection takes place.

The method of opening the abscess might be considered here. Some advocate the use of forceps and others the use of the knife. I have employed a curved scalpel, the blade of which is short and the point narrow and sharp. The latter permits of its easy penetration into the tissues, and little pain is caused. General anesthesia is contraindicated. My general aversion to cocaine precludes its employment in preparation of the patient. The operation consumes little time, and I prefer not to use a local anesthetic. It is important to clear the throat of mucus, especially in cases in which there is marked interference with movement of the lower jaw. Good illumination will greatly facilitate the operation.

I wish to refer to the more radical treatment for peritonsillar abscess recently advocated;[12] I mean tonsillectomy performed at the time of incision of the abscess. The procedure has not been in vogue long enough, and the number of cases in which it has been employed is not sufficiently large to ascertain the complications that may develop. At the best I feel that such a procedure is opposed to the well balanced logical tenets that govern treatment for suppurative processes in general. The fact cannot be disregarded, however, that many rhinolaryngologists most heartily advocate this radical removal of the tonsil during the acute stage rather than incision and drainage.[13]

I should attempt such a procedure as a general routine treatment in peritonsillar abscess only with great reluctance. It is my conviction that this measure is of the most heroic kind. I feel that in those cases in

12. Baum, H. L.: Ann. Otol. Rhin. & Laryng. **35**: 429 (June) 1926.

13. Irvine, R. S.: California State J. Med. **21**:373 (Sept.) 1923. Waring, J. B.: Virginia M. Monthly **52**:730 (Feb.) 1926. Lapat, W.: J. Kansas M. Soc. **19**:54 (March) 1919.

which suffering is most intense and repeated incisions have not been sufficient to locate and evacuate the pus, one might, as a last resort, remove a good portion of the tonsil in order to reach the pus cavity. Technically, there is no doubt that careful and complete removal is out of the question. With the edema and induration attending the inflammation, landmarks are obliterated. The normal lines of demarcation which ordinarily are the most important guides in a careful dissection are lacking. At the best, all the operator can hope for is the removal of most of the tonsil. In many instances one will find a secondary operation necessary in order to remove the remnant which in these cases especially is apt to be responsible for future recurrences.

It is my conviction, therefore, that it is a much safer and wiser plan not to substitute such procedures, which may jeopardize the patient's safety and well-being more perhaps than the condition from which he is suffering and for which he seeks relief.

Treatment of peritonsillar infection should be of more than passing interest to the physician. It may through its mere presence or through involvement of adjacent structures give rise to more serious local and general complications which may at times have a fatal termination. The keynote to the avoidance of disaster, therefore, is early diagnosis with timely and adequate incision and drainage. In my estimation, this condition deserves the utmost consideration and should call for the same assiduous surgical judgment as that exhibited in the treatment of other infections in which more serious complications may supervene.

169 New York Avenue.

Clinical Notes

THE NASAL GANGLION AND CHOREA

Case of a Patient Permanently Relieved by the Injection of Alcohol

HIRAM BYRD, M.D., TAMPA, FLA.

Early in the spring of 1924 I had the first case in which there was distinct evidence of pathologic currents registering in the motor nerves. Mr. L. of Terra Ceia had been experiencing a drawing of the muscles of one side of the face and neck. The year previously I had had a patient with a twitching of the muscles about the eye. I had cocainized the ganglion, and the twitching had stopped, but that case was not conclusive since the twitching occurred at varying intervals and completely disappeared between paroxysms. But in the case of Mr. L., the drawing of the muscles was more or less constant; it was less severe on some days than on others, and on some days it scarcely occurred at all. When the phenomenon was present, not only was the patient conscious of it, but it was plain to bystanders. The arrest of this drawing immediately following the cocainization of the ganglion, and repetition on several different occasions, always with the same results, left no doubt about the interpretation and sequence of events.

It was this case chiefly that caused me to wonder whether St. Vitus dance was not an instance of a pathologic current burning itself out in the motor nerves instead of in the sensory nerves. In February of the next year, on a visit to Dr. Sluder, I told him what my suspicions were, and predicted that sooner or later it would be discovered that certain cases of chorea would be found to be interceptible through cocainization of the nasal ganglion, and that in such cases the patients would be permanently relieved through injection of alcohol into the ganglion.

A week after my return from St. Louis, a patient with chorea reported for treatment. McD. T., aged 14, had been afflicted with chorea and rheumatism involving the left arm and leg for several years. Sometimes the condition was better and sometimes worse, but the patient was hardly ever free from it. When he was tired or excited, the condition was always aggravated. After a hard day, he usually kept some member of the family up a good portion of the night rubbing his leg and ministering to him in various ways, for both the pain and the spasmodic movements would not let him sleep. He was taken to one physician after another, who made exhaustive studies to determine the cause of the trouble, and who instituted standard methods of treatment; but all were without avail.

A year previously, I had cocainized the left nasal ganglion of the patient's sister and had caused arrest in a case of sciatica. I had followed this up with nasal treatment, and the sciatica had completely disappeared. For this reason the patient was brought to me.

When he was presented, his left arm and hand had already begun to show the angularity, the unshapeliness, and awkwardness that come from disuse, and from disturbed muscular behavior. His left leg was in poor control, so that walking was accomplished with varying degrees of difficulty.

On February 10, the patient was taken in charge. Results of a general physical examination were negative. The tonsils were not large, but cryptic;

general rhinitis was present; the teeth were good, and the ears and eyes were normal.

The left nasal ganglion was cocainized. As soon as the cocaine was applied to the ganglion, the limbs became agitated, the patient being unable to control either the arm or the leg. Within two or three minutes this disturbance passed away, and the limbs came within control—not merely the usual control, which at best was crippled, but in good control; except for the awkwardness, normality was restored.

On February 17, the right ganglion was cocainized, but without perceptible effect. Then the left ganglion was cocainized, with a duplication of the former experience. On February 20, both ganglions again were cocainized, with the same results as before, namely, that the right gave a negative result, and the left, a positive. On February 27, and on March 3, the procedure was repeated with the same results. On March 7, the right ganglion was injected with alcohol. This was done for control purposes. Good results were not expected, and none occurred. On March 20, the left ganglion was cocainized with the same results as before.

On March 25, the left ganglion was injected with 0.5 cc. of 95 per cent alcohol with 5 per cent phenol. The injection was made under local anesthesia. The symptoms at this time were active, but the cocaine relieved them. This was followed by the injection of the alcohol. For nearly three years, the patient has not had a trace of chorea. He is now more than 6 feet tall, and during the last school year has won honors in basket ball.

COMMENT

While this is the only case of chorea that has come under my observation since I have been doing work on the nasal ganglion, it is so clear-cut in all respects, and the treatment was repeated so many times under such varied conditions, that there is no doubt about the interpretation and sequence of events throughout.

That the patient was completely and permanently relieved of chorea through injecting the nasal ganglion of the left side with alcohol is not the point of transcending interest; the point of supreme interest is that a motor disturbance was intercepted, just as sensory disturbances have been, at the nasal ganglion; and this shows that the direction in which the exciting current was traveling when intercepted was toward the loci of distress.

INSTRUMENTS FOR INJECTIONS OF IODIZED OIL INTO THE SINUSES

New Adaptations for Opaque Injection Into the Accessory Sinuses of the Nose and Ear

ROBERT H. FRASER, M.B. (TOR.), BATTLE CREEK, MICH.

The instruments illustrated in the accompanying figure embody the following principles, which were found of advantage in roentgenographic examinations of 300 cavities injected with a 1:3 dilution of iodized oil in liquid petrolatum:[1] (1) pressure connections suitable for conduction of viscous oils, (2) balance and (3) ease of rotation.

1. Given dilution makes iodized oil 14 per cent.

The following features were adopted from other instruments: (1) bayonet pressure connection, cone tip (*a*) with peg for bayonet lock (*g*), (2) spool grip of 3 cc. syringe (*C*); and three ring grips (*A* and *B*); (3) Lichwitz needle, with milled rim (Skillern), (4) bayonet type of cannula, (5) Day attic cannula and (6) syringes, A and B, which need little modification.

The aluminum "cone" grip of the nasal probe, which is suitable also for the cannulas, is new. It is octagonal in section where it engages with the finger tip and thumb.

Syringes, cannulas and probe: *A* is the record syringe; *B* and *C*, the metal syringes; *D* and *E*, the maxillary and sphenoidal (ethmoidal) needles; *F* and *G*, the cannulas for natural ostia: sphenoidal, *F*; frontal and maxillary, *G*; *H* the new nasal probe and *I* the bayonet attic cannula for use with otoscope.

The combinations of principles and features are as follows: 1. Syringes, *A* and *B*, fill the sinus (maxillary) to capacity; they are useful also for calculation of the volume in any irrigation. The flexible tube, *b*, may be employed.

2. The spool grip of 3 cc. syringe, *C*, is especially suitable for injection into the attic with attic cannula, *I*, which is made (*R* and *L*) for use with electric otoscope. The tip extends 1 mm. above the shaft, deflecting the jet from 45

to 60 degrees upward, and it may be used without anesthesia through small perforations in the drum membrane, principally for irrigation of the attic. The distal arm *I*, 6 cm., extends through the otoscope, while the bayonet feature enables the syringe to lie on the observer's temple.

3. The needles, *D* and *E*, for puncture have a drilling motion of 170 degrees' rotation, 6, 7.5 and 9 cm. in length of the shaft, for the maxillary and the sphenoid sinus, respectively. The short maxillary needle, gage 16, may be left in situ and may be used for evacuation of the opaque medium after roentgenography. The additional rim (*f*) interposed proximal to the milled edge provides a firm grasp, allowing 1 Kg. of pressure along the shaft, and transmitting this force directly to the bony tips of the terminal phalanges of the thumb and fingers.

4. The straight and curved (flexible) cannulas are for the natural ostia: *F*, with buttons at 7 and 9 cm. for the sphenoid, and *G* for the frontal and maxillary sinuses.

Progress in Otolaryngology

A Summary of the Bibliographic Material Available in the Field of Otolaryngology

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PERORAL ENDOSCOPY

LOUIS H. CLERF, M.D.
PHILADELPHIA

The increasing frequency of the employment of laryngoscopy, bronchoscopy and esophagoscopy as aids in diagnosis and treatment of disease brings up the question, By whom may these procedures be carried out? In briefly discussing the technic of bronchoscopy and esophagoscopy, Chevalier Jackson [1] states that when skilfully introduced, there is no danger from the mere presence of a bronchoscope in the laryngotracheobronchial airway, nor of an esophagoscope in the esophagus and stomach. The introduction of the instruments, which are in principle specula, is highly technical. Any physician or surgeon can be taught to introduce them safely, but this cannot be learned by looking on at a clinic. Introduction of the bronchoscope, and especially of the esophagoscope, by the untaught may inflict fatal trauma; serious injury may result from improper manipulation of a foreign body, especially a pointed object.

Promptness and precision with coordinated action by a trained team of three workers is necessary for results; especially is this imperative in treating patients who are dyspneic from mechanical obstruction of the airway by disease or foreign body.

Care and preparation of the patient, both before and after operation, are considered. The technic of introduction of the laryngoscope, bronchoscope and esophagoscope is discussed and amplified by illustrations. Jackson states that the contraindications to bronchoscopy and esophagoscopy are few if performed by qualified operators, and none would contraindicate endoscopic removal of a foreign body.

In discussing the attitude of the medical profession toward peroral endoscopy, Myerson [2] says that he believes that bronchoscopists should take advantage of every opportunity to present their side of the question and to discuss the indications and contraindications of bronchoscopy.

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1. Jackson, Chevalier: Bronchoscopy and Esophagoscopy: A Brief Consideration of Technique, Surg. Gynec. Obst. **44**:795 (June) 1927.

2. Myerson, M. C.: Bronchoscopy in the General Hospital, Ann. Otol. Rhin. & Laryng. **36**:253 (March) 1927.

He feels that the average physician can be convinced of the need of bronchoscopy in diagnosis and treatment when he has seen it properly performed. Nothing jeopardizes the position of peroral endoscopy more than witnessing an unskilful attempt at its performance.

In presenting the esophagoscopic side of the question, Forbes [3] takes the esophagoscopists to task because of their failure to inform internists and surgeons fully of the present day accomplishments of esophagoscopy, its freedom from danger as a diagnostic procedure and its importance as a diagnostic aid as well as a therapeutic measure.

In relating his experiences, Tilley [4] reflects that there can be few accidents productive of more acute mental anxiety and physical distress than those caused when the entry of a foreign body into the lower air passages brings about an immediate difficulty in breathing. A pathologic lesion may effect the same result but with less suddenness. Similarly, lesser degrees of alarm and discomfort may follow the impaction of a foreign body in the esophagus.

It was as a method for the safe and successful treatment in such accidents that direct endoscopy first established itself and still remains without a rival, but its range of usefulness has been extended to diagnosis and treatment in such pathologic conditions in the lower air passages and esophagus as can be directly inspected by the endoscopist.

Watkins [5] stresses the importance of diagnostic esophagoscopy in patients presenting symptoms referable to the esophagus. In the hands of those properly trained, this is a safe procedure with practically no mortality rate. Constant practice is imperative. Attention to details concerning instruments and apparatus is important. Careful study of the patients by the laryngologist, internist and roentgenologist should be carried out before any endoscopic procedure is contemplated.

BRONCHOSCOPY IN DISEASE

Malignant Disease of the Lung.—The literature on this subject, based on clinical observations and examinations at autopsy, indicate that there is a definite increase in primary cancer of the lung. It has been pointed out by McCrae that primary cancer more often involves the bronchi, the lung tissue being secondarily invaded. This is important from the standpoint of diagnosis.

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3. Forbes, H. H.: The Neglect of Direct Examination of the Esophagus in Cases of Dysphagia, Ann. Otol. Rhin. & Laryng. **36**:1173 (Dec.) 1927.

4. Tilley, H.: Some Experiences in Bronchoscopy and Oesophagoscopy, Brit. M. J. **1**:1135 (June 25) 1927.

5. Watkins, H. R.: Esophagoscopy and Associated Problems, Illinois M. J. **51**:199 (March) 1927.

In a comprehensive discussion of the question of primary cancer of the bronchus, McCrae, Funk and Jackson [6] report fourteen cases in which the diagnosis was made bronchoscopically and corroborated by histologic study. The clinical pictures varied greatly so that a definite symptom complex could not be considered as characteristic. They consider bronchoscopy as the method of diagnosis that is most certain, and one that should always be employed. For bronchoscopic diagnosis, it is essential that the eye be thoroughly trained to recognize the color, form and movement of the bronchi in health so that any departure from the normal is at once apparent.

In conclusion, the writers state that the evidence suggests that carcinoma of the lung, which in the great majority of cases originates in a bronchus, is increasing in frequency.

These bronchial tumors appear to have a relatively low malignancy—hence the hope that early diagnosis and intensive roentgen-ray therapy may be effectual in at least prolonging life.

Early diagnosis should be made if the possibility of bronchial neoplasm is considered and careful studies are made. The early symptoms are usually those of bronchial irritation and the early signs those of bronchial obstruction. By bronchoscopy, a positive diagnosis can almost always be made promptly and proper treatment instituted. Patients who present obscure pulmonary and bronchial symptoms have a right to the benefit to be derived from such a procedure.

From the standpoint of bronchoscopy as a means of diagnosis in bronchial carcinoma, Jackson [7] stresses the need of a knowledge of the normal appearances of the tracheobronchial tree, so that the bronchoscopist may recognize the abnormal. The color of the neoplasm may be the same as that of the normal mucosa, in which case diagnosis must be based on changes in form and motility. Dilated vessels may be seen. The color may vary from normal so that the lesion may be white, yellow, red or purple of various shades; the presence of exudate or blood, also varying intensity of illumination, may alter the color. Modification of form is the most important. Biopsy, especially if surgical intervention is thought of, should always be performed.

Broadening of the carina usually means mediastinal adenopathy, which may be tuberculous or cancerous. Obliteration of the tracheal rings is often observed in neoplasm. In peribronchial neoplasm there is usually bronchial distortion, with fixity (infiltration) giving a "wooden" appearance. When it is necessary to bite through normal tissue, perhaps biopsy is contraindicated.

6. McCrae, T.; Funk, E. H., and Jackson, Chevalier: Primary Carcinoma of the Bronchi, J. A. M. A. **89**:1140 (Oct. 1) 1927.

7. Jackson, Chevalier: Bronchoscopic Diagnosis in Neoplastic Affections, Rassegna internaz. di clin., terap. **8**:680 (Oct.) 1927.

Aneurysm, tuberculosis and syphilis are to be excluded in these cases before a biopsy is performed, though occasionally, in special circumstances, it may be indicated even in the presence of a positive Wassermann test and positive sputum.

Blood is rarely absent in the later stages of the disease. Pus is usually present in the late stages of malignant neoplasm of the lung.

The occurrence of fibrosarcoma of the bronchus and its removal by bronchoscopy were reported by Kernan.[8] The patient, a woman, aged 45, had been ill for seven months with what appeared to be asthma complicated by hemoptysis. Direct examination revealed a reddish, pedunculated growth attached to the left wall of the trachea immediately below the local cords. It was removed under local anesthesia. The pathologist's report was xanthoma or fibrosarcoma, possibly malignant.

Benign Neoplasms of the Tracheobronchial Tree.—Without the aid of direct inspection, the diagnosis of benign neoplasms at the lower end of the trachea or of the bronchi would probably never be made except by inference.

Primary fibromas of the bronchus are not commonly observed, and they present diagnostic problems that can be solved only by bronchoscopy.

Burrell and Trail[9] report the case of a woman, aged 23, who seemed practically well except for hemoptysis. At one time she was confined to bed for eighteen weeks, with practically continuous hemoptysis. There was little sputum, and repeated studies failed to show tubercle bacilli. The physical signs suggested bronchiectasis, although the roentgenologic studies showed nothing abnormal. Bronchoscopy by V. E. Negus revealed a new growth attached to the wall of the bronchus of the lower lobe of the left lung. It was removed bronchoscopically with forceps. The histologic report was fibroma. At a subsequent bronchoscopy, the left bronchus was found clear, and the patient has remained well.

Zinn[10] presents an interesting case of primary bronchial fibroma occurring in the case of a man, aged 52. The patient had been ill for seven years following an attack of influenza. Diagnoses of asthma, bronchial trouble, pulmonary tuberculosis, unresolved pneumonia and massive empyema had been made, but could not be corroborated, nor did the patient improve under appropriate treatment. At bronchoscopy, the main bronchus of the left lung was found completely occluded by a large

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8. Kernan, J. D.: Three Unusual Endoscopic Cases, Laryngoscope **37**:62 (Jan.) 1927.

9. Burrell, L. S. T., and Trail, R. R.: Case of Fibroma of the Bronchus, Lancet **213**:1180 (Dec. 3) 1927.

10. Zinn, W. F.: Report of Three Cases: (a) Fibroma of Left Bronchus; (b) Ulcer of Bronchus; (c) Foreign body in Trachea and Bronchus, Ann. Otol. Rhin. & Laryng. **36**:278 (March) 1927.

growth. A specimen removed for biopsy was reported as a nonmalignant fibroma. At three subsequent bronchoscopies, the growth was completely removed. The patient was promptly relieved from symptoms, and the physical signs gradually cleared.

Papilloma of the Bronchus.—An unusual case of papilloma of the bronchi occurring in a woman, aged 42, complaining of dyspnea, is reported by Syme.[11] At bronchoscopy, a large neoplastic mass was found completely blocking the bronchus of the right lung, and partially blocking the left. It was removed and proved to be papilloma. There has not been a recurrence. Curiously, a papillomatous mass was removed from the patient's larynx one year before.

Lipoma of the Trachea.—The rare occurrence of lipoma of the trachea renders Kernan's [7] case unique as well as interesting. The patient, a man, aged 50, had been receiving treatment for five years for incessant cough, chronic bronchitis and asthma. At bronchoscopy, Kernan found a rounded tumor, attached by a broad pedicle, to the right wall of the trachea at the bifurcation. It was seen to move up and down with respiration. The pedicle was cut with biting forceps and the growth removed en masse. The pathologist's report was submucous lipoma of the trachea.

Cysts of the Lung.—Moore [12] reports an interesting case of multiple cysts of the right lung in a patient who was referred to him for bronchoscopy because of productive cough of seven years' duration. The cystic-like areas were demonstrated by roentgen-ray examination. The bronchoscopic observations were those of pulmonary suppuration involving the lower lobe of the right lung. Under bronchoscopic treatment, marked improvement was observed, although the roentgenologic examination showed practically no change. Moore concludes that the cysts were probably congenital, and that, although actual communication did not exist between bronchus and cyst, the evidences of suppuration suggest bronchial compression and interference with drainage, and subsequently, the occurrence of bronchiectasis.

Bronchoscopy in Diagnosis.—The value of bronchoscopy in diagnosis lies in the fact that objective evidence can be obtained from inspection of the trachea and larger bronchi. Without positive data, one must rely on intuitive or deductive conclusions. No better examples of the value of bronchoscopy as a diagnostic aid can be cited than those reported by Kernan,[7] Zinn,[10] Syme,[11] Burrell [9] and others.

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11. Syme, W. S.: Three Bronchoscopic Cases, J. Laryng. & Otol. **42**:751 (Nov.) 1927.

12. Moore, W. F.: Multiple Cysts of the Lung, Ann. Otol. Rhin. & Laryng. **36**:263 (March) 1927.

Syphilis of Tracheobronchial Tree.—By bronchoscopy, Lukens [13] was able to diagnose correctly the presence of cicatricial stenosis of the trachea occurring in a man who required an emergency tracheotomy when first seen. A tight stenosis was found with a lumen about 3 mm. in diameter involving the treachea at a point about 7.5 cm. below the lower border of the thyroid cartilage. The Wassermann test of the blood was positive. Under antisyphilitic treatment, the process subsided, and the patient was finally cured by bronchoscopic dilation.

Lemon [14] and others report the case of a woman, aged 51, who presented physical signs of partial obstruction of the bronchus of the lower lobe of the left lung. The Wassermann test of the blood was strongly positive. By bronchoscopy a lesion was found which involved the carina and extended into the bronchus of the left lung. A diagnosis of gumma was made. Under appropriate antisyphilitic treatment, she ultimately made a practically complete recovery.

That the mucosa of the larynx and tracheobronchial tree presents definite changes that can be definitely recognized in impending uremia, was shown by Myerson,[15] who reports a series of eleven cases in which bronchoscopic examination had been performed. A peculiar doughlike coating was found on the mucous membrane. Myerson believes that, when seen early, this coating, which may give rise to physical signs simulating bronchopneumonia, is diagnostic of impending uremia. In connection with the foregoing bronchoscopic observations, it is interesting to note that Moore [16] found continuous endobronchial aspiration feasible and of value in managing pulmonary edema in a case of eclampsia.

Bronchoscopy in Asthma.—Unquestionably, the diagnosis and treatment of asthma has been greatly augmented by bronchoscopy.

Ramirez and St. George [17] believe that bronchoscopy is of undoubted value in the so-called nonallergic forms which are associated with chronic bronchitis and bronchorrhea. The benefit derived is not from the removal of the thick, adherent mucus and the endobronchial medication alone, but also from the vaccines prepared from bronchoscopically

13. Lukens, R. M.: Gummatous Stenosis of Trachea; Report of a Case, Ann. Otol. Rhin. & Laryng. **36**:72 (March) 1927.

14. Lemon, W. S.; Vinson, P. P.; Gaarde, F. W.; Moersch, H. J., and Harrington, S. W.: The Value of Bronchoscopic Examinations to the Internist and Surgeon, Minnesota Med. **10**:10 (Sept.) 1927.

15. Myerson, M. C.: Manifestations of Uremia in Pharynx, Larynx, Trachea and Bronchi, J. A. M. A. **89**:685 (Aug. 27) 1927.

16. Moore, W. F.: Continuous Endobronchial Aspiration for Drowned Lung Complicating Eclampsia, Ann. Otol. Rhin. & Laryng. **36**:270 (March) 1927.

17. Ramirez, M. A., and St. George, A. V.: The Bronchoscopic Treatment of Bronchial Asthma, M. J. & Rec. **125**:327 (March 2) 1927.

removed secretions free from oral contamination. Autogenous vaccines prepared in this manner seem to be more effective than those prepared from sputum.

Satisfactory results were obtained by Halliday [18] from bronchoscopic treatment in a series of patients suffering with asthma. He agrees that the best results are obtained in asthmatic persons with an associated suppurative or catarrhal form of tracheobronchitis. Although definite conclusions cannot be arrived at regarding the permanency of the cures obtained, nevertheless he believes that the marked improvement and relief from distressing symptoms observed following bronchoscopic aspiration and instillation of medication renders this an important aid in treatment.

In a review of the subject of bronchial asthma from the standpoint of the bronchoscopist, I [19] am convinced that bronchoscopy, as a diagnostic measure, should be resorted to in those cases of "asthma" which present certain obscure signs and symptoms referable to the tracheobronchial tree, and which do not respond to the commonly accepted methods of treatment. Numerous examples can be cited to support this view which is entertained by all bronchoscopists. Bronchoscopic examinations in asthmatic patients have demonstrated curious conditions, not only in the appearance of the mucous membrane of the tracheobronchial tree, but also in the behavior of the tracheal and bronchial lumina during respiration and cough. These conditions have served to explain some of the symptoms considered as characteristic of asthma.

Before a patient is accepted for bronchoscopic treatment, systematic studies should be made to elicit all possible etiologic factors. The investigation should include a roentgen-ray study of the chest and a rhinologic examination, as well as the usual allergic tests.

Certain patients with asthma, especially those in whom there is a chronic tracheobronchitis or definite suppuration of the lung, respond favorably to the bronchoscopic aspiration of secretion.

Pneumography.—As an aid to the surgeon and internist in the diagnosis and treatment of pulmonary disease, pneumography occupies a place of ever increasing importance. In summarizing their views of this subject, Ballon and Ballon [20] conclude that ordinary roentgenographic study of the bronchial tree is unsatisfactory and often confusing, owing to the fact that the bronchial tree divides frequently and is frequently

18. Halliday, A. A.: On the Bronchoscopic Method of Diagnosis and Treatment of Certain Disorders of the Lungs and Bronchi, Canad. M. A. J. **17**:561 (Feb.) 1927.

19. Clerf, L. H.: Bronchoscopy as an Aid in the Diagnosis and Treatment of Bronchial Asthma, J. A. M. A. **89**:872 (Sept. 10) 1927.

20. Ballon, D. H., and Ballon, H. C.: Pneumonography with Iodized Oil, 40 Per Cent by the Bronchoscopic Method: The Bronchial Tree with Observations Made from 100 Injections, Arch. Surg. **14**:184 (Jan.) 1927.

crossed by part of the pulmonary circulation. At various age periods, the appearance of the normal bronchial tree after the injection of iodized oil appears to be constant. Abnormalities of the bronchial tree are frequent in chronic fibroid phthisis, diseases of the pleura and mediastinum and bronchiectasis. Bronchial stenosis is often found to be associated with bronchiectasis or pulmonary abscess. The branched intrapulmonary bronchi and bronchioles are the most frequent sites of bronchiectasis, putrid bronchitis, bronchiolitis and bronchiolectasis. Iodized oil by the bronchoscopic method is an aid and a guide in the selection of suitable cases for the thoracic surgeon and in the prognosis and treatment. It makes it possible to treat each patient individually, and increases the good results obtained by postural drainage.

In a detailed discussion of the technic of bronchoscopic pneumography and a presentation of case reports setting forth the advantages of this method of lung mapping, Tucker [21] concludes that the bronchoscopic introduction of opaque substances into the lung for pneumography is safer for the patient and more accurate in its localization than introduction by blind methods. Insufflation with bismuth subcarbonate, as originated by Jackson, has given the best results in outlining the trachea and larger bronchi and in bronchiectatic dilatation in the larger bronchi; iodized oil 40 per cent is best in abscess cavities and in the periphery of the lung. He believes that the most accurate pneumogram is obtained by the bronchoscopic introduction of the opaque substance on the fluoroscopic table, where the entrance of the opaque substance can be observed fluoroscopically and the plates made without transfer of the patient to another table. These considerations justify the choice of the bronchoscopic method of introduction of radiopaque substances for pneumography, aside from the great diagnostic value of the study of local conditions afforded by direct vision through the bronchoscope preliminary to pneumography.

Based on the contention of Lord, who, in his textbook, states that bronchiectasis is extremely difficult to diagnose accurately, Smyth and Schall [22] believe that the use of iodized oil is a valuable aid in the diagnosis of this condition. In their experience, simplified methods of using iodized oil are not of real diagnostic value in obscure conditions of the lung. Thorough cleansing of the bronchial tree as a preliminary procedure must be regarded as essential. Real abscesses of the lung can usually be shown only by exclusion, that is, by mapping out the surrounding normal lung. The reason for this is that these cavities are usually filled with secretion and their communication with a bronchus is

21. Tucker, G.: Technique of Bronchoscopic Introduction of Bismuth Subcarbonate and Iodized Oil, 40 Per Cent, for Pneumonography, Arch. Surg. **14**:175 (Jan.) 1927.

22. Smyth, D. C., and Schall, L. A.: Pneumonography by Lipiodol: Its Present Uses and Limitations, Ann. Otol. Rhin. & Laryng. **36**:1134 (Dec.) 1927.

often not explorable with the bronchoscope. They are convinced that the interests of the patient are best served when the internist, surgeon, roentgenologist and bronchoscopist unite in a discussion of their observations and reach a decision as to whether a diagnostic bronchoscopy would be of value in that particular patient. The question of lung mapping is left to the judgment of the bronchoscopist. Their best results so far have been attained by placing the iodized oil in the bronchus of the effected lung at a location favoring its flow by gravity toward the pathologic area, this flow being helped along by change of posture of the patient.

Iglauer [23] has found iodized oil of great value as a contrast medium in roentgenography of the chest. He believes that injection under guidance of the fluoroscope gives visual control and frequently establishes the diagnosis before roentgenograms are taken. The bronchoscopic method is preferable when specimens are to be taken, when abscesses are to be evacuated, or when direct inspection is desired. He has found brominized oil less irritating than iodized oil, and he feels that future experience may show it to be preferable, especially in tuberculous patients.

Mosher [24] directs attention to one of the difficulties encountered in the interpretation of pneumograms following instillation of iodized oil, namely, the occurrence of an area of drowned lung which simulates a true abscess of the lung. Experiments were carried out on dogs by injection of iodized oil into the air passages. The roentgenograms made showed shadows suggesting typical abscesses of the lungs, when in reality it was a saturation or drowning of a given area of normal lung. He believes that weaker solutions of iodized oil should be used and suggests that the oil be introduced with a nebulizer.

Ballon [25] is convinced that the use of iodized oil by the bronchoscopic method, when combined with a definite routine examination, is of undoubted value. He has not observed any reactions from the use of this agent in cases of abscess of the lung. He believes that healthy lung tissue on the nonaffected side, as well as on the affected side, should be demonstrated before extensive operative procedures are instituted.

The rather free and often indiscriminate use of iodized oil as a diagnostic aid and therapeutic measure has led to unhappy results. In a timely presentation of these phases of the subject, Archibald and

23. Iglauer, S.: The Use of Iodized Oil in the Diagnosis of Pulmonary Lesions, Surg. Gynec. Obst. **45**:82 (July) 1927.

24. Mosher, H. P.: False Lung Abscess and Lipiodol, Laryngoscope **37**:138 (Feb.) 1927.

25. Ballon, H. C.: The Value of Lipiodol in the Diagnosis and Treatment of Abscess of the Lung, Surg. Gynec. Obst. **44**:11 (Jan.) 1927.

Brown [26] point out that there are potential dangers accompanying the intratracheal injection of iodized oil. They report three instances of complications occurring after the use of iodized oil, one of which terminated fatally. These instances show the danger of this method in cases of tuberculosis and infections of the upper air passages. The authors conclude that the introduction of iodized oil in the tracheobronchial system carries with it a certain definite degree of danger from various sources, and that this should be carefully weighed before patients are subjected to its indiscriminate use.

This view is shared by bronchoscopists generally, and has recently been stressed by Smyth and Schall,[22] Iglauer [23] and others.

Postoperative Pulmonary Atelectasis.—Hearn and I [27] have reported a case of postoperative collapse of the lung in which the patient was successfully treated bronchoscopically. A child, aged 8 years, developed pulmonary symptoms about forty-eight hours after closure of a gastrostomy fistula under ether anesthesia. Clinical and roentgenographic examinations showed the classic picture of complete collapse of the left lung. At bronchoscopy, the main bronchus of the left lung was found completely occluded by thick, tenacious mucus. Ten cubic centimeters was aspirated, after which remarkable changes were noted in the left lung. Air entered the left lung, and by fluoroscopy, the corresponding diaphragm could be seen moving with respiration. In eighteen hours, there was a recurrence of all the signs with collapse. Fourteen cubic centimeters of thick mucus were removed at the second bronchoscopy. In all, seven bronchoscopic aspirations were performed within twenty days. The patient made a complete recovery.

Hearn and I concluded that bronchial obstruction was present in this case, and that the obstruction consisted of thick, tenacious secretion; that bronchoscopic removal of the obstruction was followed by a partial return of pulmonary function, and further, that early bronchoscopic investigation should be carried out in a case of postoperative pulmonary collapse if the surgeon and the internist deem it a safe procedure in the particular case.

ESOPHAGOSCOPY IN DISEASE

Every esophagoscopist realizes that esophagoscopy is attended by certain natural difficulties which must be recognized and overcome if the procedure is to be successfully and safely carried out. Occasionally, additional obstacles are encountered, as shown by Schall,[28] who discusses

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26. Archibald, E., and Brown, A. L.: The Dangers of Introducing Iodized Oil into the Tracheobronchial System, J. A. M. A. **88**:1310 (April 23) 1927.

27. Hearn, W. P., and Clerf, L. H.: Postoperative Massive Collapse of the Lung, Ann. Surg. **85**:54 (Jan.) 1927.

28. Schall, L. A.: The Esophagus in Pott's Disease and Scoliosis, Ann. Otol. Rhin. & Laryng. **36**:57 (March) 1927.

the problems presented by deformity of the spine and its influence on the course of the esophagus. Excellent illustrations of roentgenologic studies of the esophagus in cases of spinal deformity are shown. The writer concludes that in these cases the esophagus tends to maintain its normal relation to the anterior surfaces of the vertebrae. The complete filling of the esophagus with barium and the evident dilatation are suggestive of exaggerated twisting of the esophagus at the cone of the diaphragm. He believes that foreign bodies lodged in the esophagus above the apex of the kyphosis might be reached by peroral esophagoscopy. If the foreign body is lodged below the apex, gastrostomy with retrograde esophagoscopy might be necessary for its endoscopic removal.

In spite of the fact that an endoscopic view of the esophagus does not always insure exactness in diagnosis, McKinney [29] believes that it is the most positive means of determining the character of esophageal lesions. He cites the case of a woman, aged 35, who complained of a sensation of something in the esophagus since swallowing a prune stone, three weeks before examination. Although fluoroscopy and roentgenographic studies did not reveal foreign body or any evidences of esophageal disease, he performed a diagnostic esophagoscopy and found a superficially ulcerated area in the upper portion of the esophagus. Following several esophagoscopic applications of silver nitrate, the ulcer healed and all symptoms subsided.

Patterson [30] points out that unless one has recourse to diagnostic esophagoscopy in cases of dysphagia, few cases of esophageal disease would be recorded; this is especially true of the rarer forms. She reports the case of a man, aged 66, who complained of dysphagia. Roentgen-ray study revealed an obstruction at the cardia with some dilatation of the esophagus proximal to this point. At esophagoscopy, an inflamed, fissured and roughened mucosa was found at the cardia. A specimen removed for histologic examination showed papilloma. Four esophagoscopies were performed, and all the growths were removed. The tissue was examined microscopically, and the diagnosis of papilloma was corroborated. Patterson concludes that papillomas do not infiltrate; they exhibit a tendency to recurrence, and are best dealt with by superficial removal with cupped forceps, repeated as often as may be necessary.

Kernan [8] reports a similar case occurring in a child, aged 10. Since birth, the patient had had symptoms suggesting a spasmodic stricture of the esophagus. Roentgen-ray study revealed obstruction at the lower end of the esophagus with moderate dilatation above this. The eso-

29. McKinney, R.: Diagnostic Esophagoscopy in Ulceration. Report of Cases, Arch. Otolaryng. **5**:238 (March) 1927.

30. Patterson, Ellen J.: Multiple Papillomata of the Esophagus. Report of a Case, Ann. Otol. Rhin. & Laryng. **36**:1169 (Dec.) 1927.

phagoscopic appearances were those of a rough, fissured and vascular mucosa. The specimen removed for pathologic study showed papillomas.

Moersch and Broders [31] report an interesting case of melano-epithelioma of the esophagus. The patient, a man, aged 59, complained of painful and difficult swallowing of two months' duration. The esophagoscopic examination showed ulceration with necrosis involving the lower third of the esophageal wall. The specimen removed for biopsy revealed a melano-epithelioma.

Although tuberculous ulceration of the esophagus has been reported, the finding of an extensive stenotic lesion, apparently of tuberculous origin, renders Baum's [32] case of unusual interest. The patient, a man, aged 57, complained of dysphagia for eight months. At esophagoscopy, marked lateral deviation of the esophagus was found with infiltration of the walls and a marked stenosis of the lumen of the lower third for a distance of 15 cm. There was no ulceration. The patient ultimately died. At autopsy, extensive tuberculous involvement of the mediastinal lymph nodes was found.

The need of resorting to esophagoscopy before arriving at final conclusions regarding the roentgenologic examination in disease of the esophagus was emphasized in cases reported by Vinson.[33] In one case of pharyngo-esophageal diverticulum, esophagoscopy revealed a squamous celled epithelioma which was verified by biopsy. In a second similar case of diverticulum, a firm growth covered with necrotic material was found at esophagoscopy. The biopsy showed inflammatory tissue, although the endoscopic appearances were those of cancer. The subsequent progress of the patient suggested that the latter view was correct.

In a discussion of the treatment of patients with pulsion diverticulum of the esophagus, Imperatori [34] records three personal cases of esophageal diverticula in which the patients were treated by endoscopic inversion of the sac and by encircling the neck with a ligature. One of the operations was performed fourteen months before this review was written; and another ten months before. The patients have remained free from symptoms since the operation, and there are no signs of a returning sac. The third case is merely recorded, for the patient was operated on only two months before this report. The operation appears to be as successful as the others. Although definite conclusions cannot be arrived at regarding this method of treatment, the author believes

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31. Moersch, H. J., and Broders, A. C.: Melano-Epithelioma of the Esophagus: Report of a Case, J. A. M. A. **88**:1319 (April 23) 1927.

32. Baum, H. L.: A Case of Tuberculous Stenosis of the Esophagus, Colorado Med. **24**:228 (Feb.) 1927.

33. Vinson, P. P.: Simultaneous Occurrence of Multiple Lesions in the Esophagus, Arch. Otolaryng. **5**:502 (June) 1927.

34. Imperatori, C. J.: Endoscopic Treatment of Pulsion Diverticulum of the Esophagus, Ann. Otol. Rhin. & Laryng. **36**:1175 (Dec.) 1927.

that it is worthy of further consideration, and that it seems to compare favorably with the other methods of treating these patients.

SUPPURATION OF THE LUNG

Although bronchoscopy as a method of treatment may still be considered to be in the experimental stages, Martin [35] is of the opinion that examination of the chest in a case of nontuberculous infection of the lungs is incomplete without an endoscopic report. Bronchoscopy must be considered as an aid to the physician and surgeon because of its value in direct inspection of the trachea, the bronchi and the orifices of their subdivisions; because uncontaminated specimen of secretion can be removed for bacteriologic examination, because specimen of neoplastic or inflammatory tissue may be removed for histologic examination, and because inspection of bronchial movements can give an idea as to peribronchial thickening or fibrotic changes in the lung. With regard to bronchoscopy in the treatment of infections of the lung, he reports observations based on a series of thirty-one cases of nontuberculous bronchiectasis. Cures were obtained in some of these cases, while in others the treatment was a complete failure. He concludes that although the percentage of cures is not large, after removal of stagnant, foul secretion from the lungs when posture has entirely failed, the patient obtains immediate relief, cough is minimized, the foul odor of the breath disappears, and the life of the patient is made more endurable. He believes that bronchoscopy cannot be disregarded in the treatment for chronic nontuberculous pulmonary disease.

Early experiences with bronchoscopy led Miller [36] to doubt the general applicability of bronchoscopy in abscess of the lung. He has since modified his views and believes that the dangers and discomfort of this method can be eliminated if carried out by a skilful operator of large experience and mature judgment. Bronchoscopy is a most valuable adjunct if employed in conjunction with rest and postural drainage, both of which are basically important. In summing up, he advises bronchoscopy in cases of acute abscesses which do not drain promptly with posture; in cases in which the location of the abscess is not near the periphery; in chronic cases for the amelioration of distressing cough and expectoration, and for the diagnosis and localization of the lesion.

In a detailed study of bronchiectasis, Aucoin [37] stresses some etiologic factors, such as certain rhinopharyngeal conditions, acute and chronic

35. Martin, G. E.: Discussion on Treatment of Chronic Nontuberculous Infection of the Lungs, Proc. Roy. Soc. Med. Lond. **20**:39 (May) 1927.

36. Miller, J. A.: Medical Aspects of the Treatment of Abscess of the Lung, New York State J. Med. **27**:43 (Jan. 15) 1927.

37. Aucoin, E. L.: A Study of Bronchiectasis, Le Presse Méd. Canad. **1**:27 (April) 1927; ibid. **1**:65 (May) 1927.

sinusitis, acute bronchitis, bronchial stenosis, pulmonary abscess, atelectasis and bronchial foreign bodies. The symptoms, physical signs and laboratory observations are reviewed and discussed. The author believes that bronchoscopic pneumography, iodized oil being used, is the only means to establish an accurate diagnosis of bronchiectasis in its early stages. Bronchoscopy with lung mapping is advocated, not only to establish an early diagnosis of bronchial dilatation, but also to differentiate it from conditions which may simulate it. The author discusses the bronchoscopic aspects of treatment for bronchiectasis and stresses prophylactic measures to be employed in the early cases. In those cases in which a cure is unobtainable, bronchoscopy is a valuable palliative measure when carried out in conjunction with measures employed by the internist.

In a discussion of bronchiectasis and its etiologic relationship to disease of the nasal accessory sinuses,[38] which I published, I said that I was impressed with the almost constant association of sinus disease with bilateral bronchiectasis. No study of a patient with bronchiectasis is complete unless a careful and painstaking examination of the nasal accessory sinuses has been carried out. I believe that there are abundant clinical observations supported by experimental studies which indicate that chronic disease of the nasal accessory sinus is a factor in the production of bronchiectasis. The inhalation route of infection plays an important part in cases of chronic bronchitis; in children, the peribronchitis associated with peritracheobronchial glandular involvement undoubtedly plays an important rôle. Examination of a patient complaining of chronic cough, with or without expectoration, is never complete until a careful study of the nasal accessory sinuses has been carried out; a negative opinion on sinus disease should not be given until every necessary diagnostic means has been exhausted. Every patient complaining of unexplained chronic cough or in whom a questionable diagnosis of bronchiectasis has been made should receive the benefit of diagnostic bronchoscopy and pneumographic studies. Irrespective of their etiologic relationship, treatment for a coexisting bronchiectasis and suppurative sinusitis is not complete unless it is applied in both conditions.

Lambert [39] emphasizes the great importance of bronchoscopy in the diagnosis of bronchial neoplasms, foreign bodies and abscess of the lung. He does not consider the procedure as absolutely devoid of risk, although

38. Clerf, L. H.: Bronchiectasis Associated with Disease of the Nasal Accessory Sinuses: Etiology and Bronchoscopic Treatment of Bronchiectasis, Arch. Otolaryng. **6**:28 (July) 1927.

39. Lambert, A. V. S.: Pulmonary Abscess and Its Treatment from the Surgical Standpoint, New York State J. Med. **27**:47 (Jan. 15) 1927.

in expert hands this can be reduced to a minimum. Its value, however, may be so great that it is well worth while to face that risk for the sake of important information which may be gained, in addition to the possibility of effecting a cure by that means alone. In discussing the ideal time for external operation with regard to the condition of the surrounding lung tissue, he believes that this can best be attained by treating the patients by conservative methods aided by bronchoscopy in suitable cases.

In a case reported by Johnson,[40] the question of the form of surgical treatment to be considered for an empyema of one year's duration depended on the ability of the lung to reexpand. The author introduced a bronchoscope into the bronchus of the affected lung and introduced oxygen under pressure through an aspirating tube into the bronchus. During this procedure, the patient's chest was observed fluoroscopically to determine the resulting changes. There was nothing to indicate that the involved lung expanded; instead there was displacement of the heart toward the normal side.

Interesting observations made by Daily and Daily[41] suggest that there is definite advantage in the use of light anesthesia for tonsillectomy. This may aid also in determining the influence of the aspiratory route in the production of post-tonsillectomic abscess of the lung. By performing bronchoscopy on patients, tonsillectomized under deep general anesthesia, they corroborated Myerson's observations regarding the frequent occurrence of blood in the tracheobronchial tree. In these, blood was not found by esophagoscopy in either esophagus or stomach. In patients operated on under light anesthesia, blood was rarely found in the tracheobronchial tree and was commonly observed in the stomach. The observation that, under light anesthesia, with preservation of the pharyngeal and swallowing reflexes, blood was found in the esophagus and stomach with none in the tracheobronchial tree, led to the obvious conclusion that the pharyngeal and swallowing reflexes have a more determining effect than the laryngeal reflex on the absence or presence of blood in the lung.

FOREIGN BODIES IN THE AIR AND FOOD PASSAGES

Foreign Bodies of Dental Origin.—The outstanding contribution to the literature on foreign bodies is that of Jackson,[42] who reports the occurrence of seventy-one cases of foreign bodies of dental origin among the 1,728 foreign bodies removed from the air and food passages at the

40. Johnson, L. J.: Results of One Year's Bronchoscopic Study, Boston M. & S. J. **197**:263 (Aug. 18) 1927.

41. Daily, L., and Daily, R. L.: Bronchoscopic and Esophagoscopic Observations in Tonsillectomies, Texas State J. M. **23**:277 (Aug.) 1927.

42. Jackson, Chevalier: Bronchoscopic Cases of Dental Interest: Dental Foreign Bodies in the Air and Food Passages, J Am. Dental A., August, 1927.

bronchoscopic clinic. Jackson comments on the relative infrequency of dental accidents in which foreign bodies are lost and pays a tribute to the care, skill and foresight of members of the dental profession. Nevertheless, the frequency of these accidents may be greater than is generally suspected. Many of the cases of dental foreign bodies in the air passages were unsuspected until revealed by a roentgen-ray study made in the routine examination in cases of suppuration of the lungs.

Although the aspiration of metallic objects may be followed by a symptomless interval, it has been the author's experience that, in the case of teeth, symptoms of bronchial irritation are set up almost immediately after aspiration. The subject of prophylaxis is discussed at length and is worthy of serious consideration by the dental profession. If a dental object has disappeared in the pharynx, Jackson advises that the patient should be immediately informed of the suspected possibility and a roentgen-ray examination recommended. This should include the entire alimentary canal and respiratory tract, from the nasopharynx to the tuberosities of the ischia. If lodged in the esophagus, the foreign body can be removed by esophagoscopy without anesthesia. If found in the tracheobronchial tree, the foreign body can be removed through the mouth by bronchoscopy. In either case, the removal can be quickly and safely effected. External operation or any other procedure is not worthy of a moment's consideration. The occurrence of complications in the lungs following dental procedures, not unlike those following tonsillectomy, and unassociated with a foreign body, is briefly considered.

In conclusion, the writer states that cough after any operation, with or without general or local anesthesia, is always a matter for investigation, as all surgeons know. Dentists are fortunate in having fewer pulmonary complications than other practitioners, and hence may be less alert to these possibilities. When a patient has a cough, however slight, following a dental procedure, it seems advisable for the welfare of the patient as well as for the interests of the dentist concerned to determine whether the cough is etiologically connected with the procedure or is purely intercurrent. Most often, the latter will be the case, but neglect of investigation on this assumption would expose the dentist to liability, morally and financially.

It is unwise to conclude from an absence of symptoms that no foreign body has reached the tracheobronchial tree; even cough may be entirely absent for a time.

After every multiple extraction of teeth, the teeth should be counted as the nurse counts the sponges during an abdominal operation. Parts of teeth and fillings should be matched for missing fragments. Doubtless, this is done by most exodontists, but in some of our cases, a missing

portion of a tooth must have been overlooked in the accounting. If any tooth, filling or fragment is missing, roentgen-ray examination and watching of the stools should be advised.

No one, in principle, is liable for the results of an accident occurring in spite of care and safeguarding; but neglect of investigation on occurrence of suspicious symptoms involves liability as well as neglect of technical precautions against accident.

Roentgen-ray examination should include the patient's whole anatomy between the levels of the nasopharynx and the tuberosities of the ischia.

In the discussion, W. F. Manges calls attention to the frequency of negative roentgen-ray reports that have been given concerning patients who developed symptoms of pulmonary disease following dental operations. Often a careful study of the roentgenograms in these cases will reveal faint shadows. Reexaminations of these areas of the chest, by making roentgenograms that show utmost contrast and detail, have often demonstrated a foreign body. In other instances, foreign body shadows have been obtained after bronchoscopic aspiration of pus from that portion of the lung involved. A. L. Midgley believes that while some of these accidents may be unavoidable, many of them can be prevented by following precautionary measures at all times and by having in mind that dental operations properly performed require time and care. He sets forth in detail certain precautionary measures which should be practiced by dentists to avoid these accidents that often cause much suffering to patients and embarrassment to the members of the dental profession.

In a review of the literature bearing on dental foreign bodies encountered in the air and food passages as well as in the nasal accessory sinuses and adjacent tissues, Bouland [43] finds that of 250 cases, 235 dental objects were found in the air and food passages. Of these, 101 were in the former and 134 in the latter. The cases reported are classified under several headings, and these contain numerous interesting data as to the etiology, symptomatology and diagnosis. From the standpoint of diagnosis, it is interesting to note how frequently these cases are considered as bronchitis, pleurisy and pneumonia. In addition to the usual precautionary measures, he advocates the use of fairly good sized handles to be attached to such small instruments as dental burrs, reamers, brooches and needles. Mention should be made of the extensive and complete bibliography covering the literature on dental foreign bodies.

Foreign Bodies of Vegetal Origin.—In a detailed discussion covering the clinical and roentgenologic phases of the "peanut" problem, Kinlaw [44]

43. Bouland, A.: Foreign Bodies of Dental Origin in the Body, La Semaine Dentaire, Thesis, 1927.

44. Kinlaw, W. B.: The Diagnosis of Peanuts in the Bronchi of Children (Arachidic Bronchitis), South. M. & S. **39**:257 (April) 1927.

concludes that vegetable foreign bodies (peanut being the most common one) are most often found in young children and produce a rapid and severe toxemia. A positive history of choking, gagging and coughing is of great value in diagnosis, but a negative history is valueless. In his experience, the most constant symptom is decreased expansion on the affected side. Fluoroscopic and roentgen-ray studies are of great value; however, it is important that the roentgenograms be made at the end of inspiration and expiration. Early diagnosis and bronchoscopic removal comprise the only safe procedure in these cases.

Stiles [45] reports his observations on a series of fifteen cases of vegetal foreign bodies in the air passages. With one exception, a boy, aged 7, all of his patients were children between 1 and 4 years of age. In four instances, the foreign body was found in the trachea; in five, in the right bronchus, and in six, the left bronchus was obstructed. Although in every case the foreign body obstruction was of brief duration, the local inflammatory reaction and systemic intoxication were more marked than is ordinarily observed in inorganic foreign bodies. He concludes that vegetal foreign bodies often remain movable in the trachea, with the consequent danger of subglottic impaction and asphyxiation. The prognosis is favorable if early bronchoscopy is performed, while if these patients are not treated, they almost invariably die.

An interesting case of peanut in the bronchus occurring in a child, aged 4, was reported by Baxter and McDonald.[46] A severe systemic reaction resulted, and there were physical signs of obstruction to the right bronchus. The roentgen-ray examination indicated a nonopaque foreign body. At about the time that bronchoscopy was decided on the patient developed whooping cough. Bronchoscopy was temporarily deferred. The peanut was ultimately removed bronchoscopically, and the patient made a good recovery.

Wright [47] reports the interesting case of a child, aged 2 years, who was admitted with a diagnosis of suspected laryngeal diphtheria. There was stridor and an asthmatoid wheeze, with physical signs of consolidation at the base of the right lung. A diagnosis was made of bronchial obstruction, probably of foreign body origin. When bronchoscopy was performed, a fragment of nut was found in the bronchus of the right lung. The child made an uneventful recovery. The diagnosis of diphtheria was not confirmed.

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45. Stiles, P.: Vegetal Bronchitis: Observations of Fifteen Cases, South. M. J. **20**:269 (April) 1927.

46. Baxter, J. M., and MacDonald, C.: Peanut Impacted in Right Bronchus, M. J. Australia **1**:752 (May 21) 1927.

47. Wright, A. J.: Foreign Body (Nut) in the Bronchus, Proc. Roy. Soc. Med. Lond. **20**:1396 (July) 1927.

Le Jeune [48] reports the case of a child, aged 15 months, who had diphtheria complicated by the presence of a foreign body—a piece of charcoal, in the trachea. Antitoxin was administered, and the membrane gradually disappeared. Croupy cough, labored breathing and a typical asthmatoid wheeze persisted. The piece of charcoal was removed at bronchoscopy, and the patient made an uneventful recovery.

In a review of sixteen personal cases of foreign body obstruction, Lasagna [49] observes that foreign bodies most commonly are found in the young. In the cases of esophageal foreign bodies in the young, dysphagia may not be a prominent symptom, as the patient often is on a liquid diet. He believes that the passage of sharp, pointed foreign bodies can occur through the esophageal wall without leaving traces.

In a discussion of latent foreign bodies in the young, Guisez [50] believes that fatal bronchopneumonia or purulent pleurisy of foreign body origin in young children is probably of more frequent occurrence than might be supposed. Foreign bodies in the air passages can readily be overlooked, especially if the physician fails to appreciate and properly interpret respiratory difficulties and physical conditions. A careful roentgen-ray examination should always be resorted to in obscure cases, and if this fails to disclose the presence of a foreign body, diagnostic bronchoscopy should be considered. The author cites examples setting forth the value of these procedures. In a number of instances, opaque objects were discovered by roentgen-ray study, and the patient made a prompt recovery following bronchoscopic removal of the foreign object.

Rose [51] reports the successful bronchoscopic removal of a metal collar stud from the right bronchus. The patient had symptoms and signs referable to the chest; however, two roentgen-ray studies did not reveal a foreign body. A third examination revealed a metallic object in the bronchus of the right lung. On being informed of this, the patient recalled that he had choked on a collar stud twelve years before examination.

Following the suggestion of Chevalier Jackson, a group of fifty-one cases of foreign bodies were tabulated by Arbuckle,[52] setting forth data regarding the tube and forceps used, the mechanical problems involved,

48. Le Jeune, F. E.: The Diagnosis of Foreign Bodies in the Lung, New Orleans M. & S. J. **79**:674 (March) 1927.

49. Lasagna, F.: Foreign Bodies in the Respiratory and Digestive Passages, Il Policlin. **34**:454 (March 28) 1927.

50. Guisez, J.: Latent Foreign Bodies in the Air and Upper Digestive Tract in Young Children, Especially Infants, Presse méd. **35**:642 (May 21) 1927.

51. Rose, F.: Foreign Body Removed from the Right Bronchus, Proc. Roy. Soc. Med. Lond. **20**:591 (March) 1927.

52. Arbuckle, M. F.: Foreign Bodies Impacted in the Lower Air and Food Passages, J. Missouri M. A. **24**:445 (Oct.) 1927.

the point of seizure and such other interesting data as had a bearing on the problems met with in the individual case. He reports in detail the case of a child, aged 16 months, who aspirated a rubber cork while efforts were made at decannulation. Roentgen-ray studies revealed typical obstructive emphysema involving the middle and lower lobes. The foreign body was successfully removed bronchoscopically.

In a discussion of pulmonary complications following operations on the nose and throat, Tucker [53] reports fourteen cases of foreign body accidents. Of these, thirteen produced obstruction of a bronchus, and, in one instance, the foreign body lodged in the alimentary canal. While in many of these cases the accident was recognized at the time of its occurrence and proper treatment immediately instituted, it was overlooked in several, and the foreign body was discovered by the roentgenologist in his routine study of the chest for diagnosis of the pulmonary lesion. Curiously, eleven of the cases were referred to the clinic during the past year. This brings up the question whether there has been a sudden increase in the number of these accidents, or whether the medical profession is beginning to realize that foreign body must always be considered as an etiologic factor in postoperative pulmonary complications. In connection with cases of foreign body accidents, Newman [54] reports an interesting case of abscess of the lung occurring in a boy, aged 10. His symptoms dated back to a tonsillectomy performed two years before examination. Bronchoscopic aspiration was instituted. At the fourth bronchoscopy, a piece of rubber tubing was removed from the abscessed area. This was identified as having been used during the tonsillectomy.

A patient suffering from bronchiectasis was examined by Lawton and Scantlebury,[55] who instituted bronchoscopic studies. At the second bronchoscopy, the vertebra of a rabbit was found and removed. Marked improvement in the symptoms and physical signs and in the patient's general condition was observed.

The differential diagnosis of foreign bodies lodged in the esophagus usually is not attended with great difficulty if a careful and systematic study is made, which should include a roentgen-ray study of the esophagus without and with a radiopaque mixture. Chamberlin [56]

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53. Tucker, G.: Peroral Endoscopy; Its Use in Complications Following Operations on the Nose and Throat, Arch. Otolaryng. **5**:321 (April) 1927.

54. Newman, M. E.: Newer Methods in Bronchoscopy and Esophagoscopy with Special Reference to the General Practitioner, New York State J. Med. **27**:294 (March) 1927.

55. Lawton, F. B., and Scantlebury, C.: Foreign Body in the Lung, M. J. Australia **1**:625 (April 23) 1927.

56. Chamberlin, W. B.: Address of the President, American Bronchoscopic Society, 1926, Ann. Otol. Rhin. & Laryng. **36**:248 (March) 1927.

reports the cases of two patients, aged 7 and 9, respectively. In both of these, there were marked disturbances in the function of swallowing. In one case, there was some difficulty with respiration. Both patients were sent to Chamberlin at the hospital. One patient died in the ambulance, and a subsequent diagnosis of acute anterior poliomyelitis was made. Complete stoppage of the barium meal at the level of the larynx was found in the other patient. He died shortly after admission to the hospital. A diagnosis of anterior poliomyelitis was made and confirmed at autopsy.

In a report of twenty cases of foreign bodies producing obstruction of the esophagus, Kearney [57] expresses the views held by all esophagoscopists, that indirect and blind methods of removal of foreign bodies from the esophagus not only are highly ineffective, but are extremely dangerous and invariably complicate the problems of subsequent removal. The coin catcher, bristle probang and bougie are antiquated methods which have long since been replaced by methods carried out under direct vision.

Norrie [58] reports the case of a Hindu child suffering from acute inanition because of marked dysphagia. There was a history of swallowing a pice, an Indian coin, two months before examination. Roentgen-ray examination revealed the foreign body in the esophagus at the level of the suprasternal notch. It was removed esophagoscopically, according to the Jackson technic.

Expulsion, by vomiting, of foreign bodies lodged in the stomach is an uncommon occurrence. This has occurred once in the experiences of Orton [59] and Iglauer, in the case of safety pin in the stomach. In another case of safety pin in the stomach, reported by Iglauer,[60] the foreign body was undoubtedly regurgitated into the esophagus, as it was observed roentgenographically with the point and keeper downward, in the upper thoracic esophagus, two days after it had been observed in the stomach by roentgen-ray examination. It was removed by esophagoscopy from its new location.

From his vast experience in the roentgen-ray study of cases of foreign bodies producing esophageal obstruction, Manges [61] believes that

57. Kearney, H. L.: Foreign Bodies in the Air and Food Passages, New Orleans M. & S. J. **80**:184 (Sept.) 1927.

58. Norrie, F. H. B.: Case of Foreign Body in Esophagus, Indian M. Gaz. **62**:266 (May) 1927.

59. Orton, H. B.: Auto-Expulsion of Foreign Body from the Stomach, Laryngoscope **37**:839 (Nov.) 1927.

60. Iglauer, S.: Open Safety Pin in the Stomach, the Point Downward in the Esophagus: Removal, Laryngoscope **37**:839 (Nov.) 1927.

61. Manges, W. F.: Roentgen Diagnosis of Foreign Bodies in the Esophagus, Am. J. Roentgenol. **17**:44 (Jan.) 1927.

foreign bodies lodge in the esophagus for one or more of a number of reasons: (1) because they are too large to pass; (2) because they become more or less embedded in the mucous membrane; (3) because the lumen of the esophagus is narrowed by some other lesion and offers obstruction to the passage of even small bodies or of food, or (4) because they may even perforate the esophagus and project into the periesophageal tissues. The large foreign body, causing partial or complete obstruction of the esophagus and which lodges because of its size, is the common type in children and infants, while the small, slender type that becomes more or less embedded in the mucous membrane is much more common in adults than the large obstructive type, and is seldom found in children.

In the diagnosis and localization of foreign body, one should not depend only on the roentgenoscope to exclude slightly opaque foreign bodies. On the other hand, it is the most important part of the study in the case of the nonopaque variety. One should never make a negative diagnosis of foreign body from the roentgen-ray examination alone.

In the study of nonopaque esophageal foreign bodies, Manges uses bismuth salts, as suggested by Jackson, since they seem to exert a beneficial therapeutic effect in cases of injury to the mucosa. In carrying out the capsule test for small nonopaque foreign bodies, the patient should be in the erect posture in order that the influence of gravity may assist in the passage of the capsule.

Iglauer [62] finds iodized oil preferable to bismuth and barium sulphate in localizing certain nonopaque foreign bodies producing obstruction of the esophagus. Following the use of barium or bismuth, both of which coat the esophageal wall and foreign body, it is often difficult to obtain a good view of the foreign object and as a result considerable time and effort is expended in removing the radiopaque material. In the case of iodized oil, this can be readily removed, thus immediately bringing the foreign body into view. He also believes that in a case of suspected esophagotracheal fistula, iodized oil is to be preferred as its entrance into the bronchi does not cause any ill effect on the patient.

Peroral Gastroscopy.—I [63] wish to report the case of a boy, aged 13, who accidentally swallowed two capsules containing a total of 100 mg. of radium element which was being used for treatment of a sarcoma of the antrum of Highmore. The usual custom of expectant treatment under roentgenologic observation was not followed because of the char-

62. Iglauer, S.: Ingested Lipiodol to demonstrate (1) Nonopaque Foreign Bodies in the Esophagus; (2) Esophagotracheal Fistula, Ann. Otol. Rhin. & Laryng. **36**:1157 (Dec.) 1927.

63. Clerf, L. H.: Radium Capsules in the Stomach; Gastroscopic Removal, Am. J. Roentgenol. **17**:635 (June) 1927.

acter of the material swallowed. The foreign body was removed by peroral gastroscopy with fluoroscopic localization, the double planed being used. In this case, the advantages of gastroscopic removal over surgical intervention were obvious. Without general or local anesthesia, and without abdominal laparotomy, certain definite risks were avoided. Convalescence was brief, the patient being able to leave the hospital the following day. Peroral gastroscopy, in the hands of an experienced endoscopist, is the safest and best method of removal of foreign bodies from the stomach.

Although it is not within the purview of this abstract to consider reviews of current textbooks on the subject of peroral endoscopy, I do not believe that this article would be complete without a brief reference to the second edition of the textbook on "Bronchoscopy and Esophagoscopy" by Chevalier Jackson.[64] The second edition, unlike its predecessor, is more than an abstract of "Peroral Endoscopy and Laryngeal Surgery." The work is presented in a practical manner by a detailed descriptive text and excellent illustrations. In addition to a complete presentation of the many phases of foreign bodies in the air and food passages, there are many chapters devoted to the diagnosis and treatment of diseases of the larynx, trachea, bronchi, lungs and esophagus. A complete bibliography of the publications of the bronchoscopic clinic is appended.

Additional interesting accounts of cases of lodgment of live fishes in the upper air and food passages in man are reported by Gudger.[65]

According to Horning and McKee,[66] the field for peroral endoscopy in dog and cat practice is far greater than is generally realized by practitioners. In addition to its use for the removal of foreign bodies obstructing the air and food passages, the greatest field for this work lies in the diagnosis and treatment of suppurative lesions of the lungs and diseases of the esophagus and stomach. A brief description of the instrumentarium is given and the methods employed in examination and treatment are discussed.

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64. Jackson, Chevalier: Bronchoscopy and Esophagoscopy, ed. 2, Philadelphia, W. B. Saunders Company, 1927.

65. Gudger, E. W.: Live Fishes Impacted in the Pharynx of Man, Arch. Path. **4**:346 (Sept.) 1927.

66. Horning, J. G., and McKee, A. J.: Peroral Endoscopy, J. Am. Vet. M. A. **7**:304 (June) 1927.

Abstracts from Current Literature

Ear

Bilateral Symmetrical Breaking Down of the Temporal Bone, of the Mastoid Process and Almost of the Whole Pyramid. Georg Jung, Ztschr. f. Hals-, Nasen- u. Ohrenh. **19**:211 (Oct. 28) 1927.

In a boy, aged 1½ years, the absence of the temporal bone was noticed during an operation. The mastoid process and the temporal bone were to a great extent replaced by granulations. The defect was almost symmetrical on the two sides. There was a suggestion of aplasia of the temporal bone. Histologic observations, however, showed a bilateral breaking down of both temporal bones, of the mastoid process and of the pyramid. This breaking down was so extensive and occurred so quickly that a specific process was suggested. This could not be proved, however, by any methods at disposal. Therefore, the question remained unsolved.

The Mechanism of Irritation of the Otolith Apparatus. S. Kompanejetz, Ztschr. f. Hals-, Nasen- u. Ohrenh. **19**:231 (Oct. 28) 1927.

1. In diseases of the labyrinth, if the usual methods of examination of the function of the vestibular apparatus do not yield any results, the eyes must be examined for counter-rolling. By this examination, the correct diagnosis can sometimes be made. The observations may contribute also toward the establishment of the clinical picture of diseases of the otolith apparatus.

2. The position in which one of the two patients under observation found a relative amount of rest, namely, the least pronounced symptoms of dizziness and the results of the examination of the counter-rolling of the eyes in both patients make it appear probable that a maximal irritation of the otolith apparatus takes place, not by pressure, but by the hanging down of the otoliths. These observations support the theory of R. Magnus and A. de Kleyn and oppose the theory of F. H. Quix.

3. Of all methods of examination, the test of the tonus of the upper extremities is the least reliable for the diagnosis of a possible disease of the otoliths.

4. In disease of the otolith apparatus there is not always a "position of dizziness." On the other hand, there can be a single position in which dizziness is least pronounced, probably on account of the maximal irritation of the sacculus vestibuli.

5. A disease of the otolith apparatus shows itself not only in a disturbance of the counter-rolling of the eyes to the healthy side when the head is bent to the diseased side, but also in a disturbance of the symmetry of the movements of both eyes, namely, in a disturbance of the associated movements of the eyes.

Pulsation and Visibility of the Bulb of the Jugular Vein Through the Intact Drum-Membrane, and Report of Some Cases. M. Slobodnick, Ztschr. f. Hals-, Nasen- u. Ohrenh. **19**:240 (Oct. 28) 1927.

1. The possibility of injury to the bulb of the jugular vein must always be kept in mind in surgical intervention, on account of the relatively great frequency of the protrusion of the bulb of the jugular vein through the floor of the tympanic cavity. This is especially the case in persons suffering from rickets and in children up to 10 years of age.

2. The pulsation of the bulb is dependent on respiratory movements. The muscle system of the neck participates only to a small degree.

3. In two of the three cases reported, the bulb of the jugular vein appeared to be larger when the patients were lying down. This was a mechanical consequence of the greater flow of blood to the brain, and of the smaller outflow in the horizontal position. The aggravation of subjective noises, while the patient was lying down, was attributable in part to the same cause.

ENDOLYMPH CURRENT IN THE SEMICIRCULAR CANALS. W. UNDRITZ, Ztschr. f. Hals-, Nasen- u. Ohrenh. **19**:275 (Oct. 28) 1927.

1. Investigations of the author confirm the experiments of Maier and Lion, who showed that variation of temperature and rotation may cause a motion of the fluid in glass capillaries of the dimensions of the human membranous semicircular canals.

2. The start of the movement of the fluid depends, all things being equal, also on the difference of temperature.

3. The relation of the velocity of the current in reference to the radius and the length of the capillary was directly proportional to the square of the radius, and indirectly proportional to the length of the capillary.

4. The observations on the relation of the velocity of the current to the difference in temperature (D) correspond closely with the results of Maier and Lion. They also corresponded with the statement of Schmalz concerning the semicircular canals. (With $D = 1$ C., the shifting of the endolymph is stated to be 2 microns per second.)

5. The smallest difference in temperature (D) that could be determined with the thermo-element and caused a noticeable movement was 0.2 C.

6. The experiments confirmed the correctness of the principle of W. Wojatschek concerning the determination of the extent of the extralabyrinthian obstacle of heat conduction by calorization at two different temperatures.

7. The experiments prove the possibility of endolymph movement and furnish support to the physical theory, although they do not justify the exclusion of all other supplementary factors, for instance, the effect of the blood vessels. Therefore, this physical phenomenon furnishes the most natural explanation of all physiologic facts that can be explained by an endolymph movement.

FLYING AND THE OTOLITH APPARATUS. FRIEDRICH NOLTENIUS, Ztschr. f. Hals-, Nasen- u. Ohrenh. **19**:300 (Oct. 28) 1928.

The author thinks that Leiri (*Ztschr. f. Hals-, Nasen- u. Ohrenh.* **17**:381 [Feb. 22] 1927), who is not a flier himself, made some erroneous statements. Noltenius, who made about 500 flights, states that a real fall almost never occurs. The downward movement scarcely ever exceeds, and mostly is less, than, 5 meters, with a possible exception in cases in tropical countries. Even the spin is more rapid than from 50 to 70 meters a second. Only a special technic allows 100 meters a second, which the author succeeded in obtaining. The author stated previously that the position of the axis of the head in space is of fundamental importance. The sensation of falling is felt only when the axis of the head is in a vertical position. Leiri is right when he states that the body loses its weight in a free fall, but only if the whole potential energy of "gravity" is changed into the kinetic energy of the "fall." When flying downward, the body lost little of its weight. Applied to the otolith apparatus, it means that the pressure of the otolith plates on the sensory hairs is diminished and then abolished (in a real fall). But an active pulling of the hairs can never occur, except in a direct "throwing motion" downward, as apparently occurs in tropical and subtropical regions. Leiri attributes attacks of faintness to a falling motion. This phenomenon has nothing to do with a falling motion or with an irritation of the vestibular organ. The real fall is of short duration and occurs only comparatively near the ground. A fall as a result of faintness would be fatal. Noltenius has never heard of such an occurrence. Furthermore, this faintness should occur in every case of seasickness, in which the otolith apparatus is much more irritated. Besides, the fliers recuperate from their faintness during the fall. If the fall were the cause of the fainting spell, they could not do so. The cases mentioned by Head are typical pictures of lessened air pressure and lack of oxygen in greater altitudes. Noltenius criticizes other statements of Leiri. Chilow's experiments agree with the observations of the author. If a severe gust of wind hits a flying bird from the

right, the body of the bird is thrown to the left. The otolith plate deviates a little to the right. Which motion of the wing and rudder must follow in order that the bird can continue its flight? The bird must turn to the right. It must raise the left wing (abduction), lower the right wing (adduction) and raise the tail feathers energetically. The experienced flier steers in the same manner when he feels the wind coming from the side. Chilow centrifugalized mice, in order to disturb the otolith plates. The animal could move freely in the box, because it jumped out after rotation. Through centrifugal force, the animal was pushed to the wall and whirled around with the axis of the body placed at a tangent. If the rotation was to the right, with the face forward, the otolith plates moved to the right. This corresponds with a sharp shifting of the body of the animal to the left. "Experiment (Chilow): A white mouse was centrifugated to the right, during 5 seconds with a velocity of 1,500 turns per minute. When the rotation ceased, the animal jumped out of the box and rotated to the right around its own axis. It became quiet after 1 minute, lay on its right side, adducted the right extremities and abducted the left. Soon it started circus movements to the right. The tail stood vertical. It took some force to move it downward, but it returned immediately to the vertical position. A control mouse kept the tail in a horizontal position." Chilow's results correspond exactly with the reactions of a flying bird. The raising of the tail of the mouse, a reflex which appears to be purposeless in the mouse, is of fundamental importance for the bird. A gust of wind from behind demands, in the bird, a supination of the anterior extremities, perhaps also of their forward movement, and a raising of the tail feathers in order to enable it to stay at the same altitude, while the velocity, compared with that of the surrounding air, is diminished. On the other hand, a gust from the front demands pronation, a backward motion of the wings and a lowering of the tail feathers. Leiri stresses too much the importance of the otolith reaction in its relation to the lowering of the blood pressure. It is taken for granted that a real fall, as it may occur near the ground, lowers the blood pressure. The loss of tonus of the muscles, in which is a large portion of the blood vessels, may be responsible; also, perhaps, a loss of tonus of the arterial wall. Yet, the same phenomenon is caused by a decrease of the atmospheric pressure. Referring to investigations of Van Walfften-Palthes, Leiri states that if the airplane moves in a curve, in a horizontal plane, a relative motion of the endolymph in reference to the cristae ampullares takes place, but that the flier does not perceive the angular movement if visual impressions are excluded. Noltenius claims that the angular movement occurs much too slowly and is perfectly even, so that an endolymph current of any significance cannot set in. If a person is turned once in twenty seconds in a turning chair, he does not experience much sensation. The ordinary total curve in a double seater or in a plane seating more persons, scarcely takes less time. Dizziness while looking toward the top of the wing, which stands higher, on account of flying in a curve, is purely psychic, because the flier has lost his orientation in space when he turns his eyes from the ground or the horizontal line. If the top of the wing glides over a background covered by clouds, a railroad nystagmus may develop, because the eye, wandering jerkily, looks for fixation points, which it fixates for a while. This is essentially an optical nystagmus. It does not occur when the flier looks toward the slowly moving ground, and also not when he looks toward the horizon which appears only as an oblique or vertical line, in its unusual position, over which the eye passes without fixation.

AMBERG, Detroit.

Nose

CHOLESTEATOMA OF THE NASAL ACCESSORY CAVITIES. THE ORIGIN AND CONDITION OF THE GROWTH. A. LAUTENSCHLAEGER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **19**:286 (Oct. 28) 1928.

By the implantation of epidermis into a maxillary antrum on which a radical operation has been performed, and subsequent closure of the same, a

tumor can be produced which has all the qualities of a cholesteatoma. The epidermis implanted in the maxillary antrum acquires, under certain conditions, an active and destructive tendency to grow, which is not present in similar tissues implanted under the same conditions. The experiments and observations prove the character of the cholesteatoma to be that of an implantation tumor.

ROENTGEN-RAY EXAMINATION OF THE FRONTAL SINUS. HELMUTH RICHTER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **19**:310 (Oct. 28) 1928.

Because the percentages mentioned in a previous article do not refer to the total number, 800, or the number of males (372) and females (428), but to the number of persons with large, medium-sized, etc., frontal sinuses, the conclusions should read:

1. Large frontal sinus cavities are more frequently found in the male (5 per cent) and small ones in the female (13 per cent).

2. In 800 patients, the frontal sinus was missing sixty-one times (=8 per cent). It was missing twenty-six times in 372 males (=7 per cent), and thirty-five times in 428 females (=8 per cent).

AMBERG, Detroit.

Miscellaneous

SELF-FIXATING APPLIANCE FOR BRUENING'S SPECIAL ELECTROSCOPE. A. SEIFFERT, Ztschr. f. Hals-, Nasen- u. Ohrenh. **19**:238 (Oct. 28) 1927.

The chest fixation autoscope is indispensable in a large clinic. In private practice such an apparatus is used relatively seldom. Therefore, Seiffert devised an inexpensive auxiliary apparatus which furnishes a self-fixating speculum when combined with Bruening's electroscope. It is essentially a stem with a movable disk, and an additional disk which presses on the larynx can be added. After the introduction of the tube, the auxiliary apparatus is attached to the electroscope, and the disk is pushed against the chest. The auxiliary apparatus is removed in the reverse manner when the electroscope is taken off.

CHANGES OF THE SOFT PALATE AS A DIAGNOSTIC SIGN. HANS SCHLESINGER, Ztschr. f. Hals-, Nasen- u Ohrenh. **19**:258 (Oct. 28) 1927.

Paul Neuda stated that the soft palate furnished a diagnostic sign in certain diseases. Schlesinger studied the question in order to verify Neuda's claims. He came to the conclusion that hyperemia of the mucous membrane of the soft palate is not of great value as a diagnostic sign but that the yellow tint of the soft palate in many instances may point to disease of the liver and gallbladder ducts. The author was unable to state why the discoloration should take place just at that spot.

The main consideration is the practical application. Further investigations are required.

SIGNIFICANCE OF ESOPHAGOSCOPY FOR THE DEVELOPMENT OF EMPHYSEMA IN PERFORATION OF THE ESOPHAGUS. A. SEIFFERT, Ztschr. f. Hals-, Nasen- u. Ohrenh. **19**:295 (Oct. 28) 1928.

Absence of emphysema when esophagoscopy has not been performed is not proof of the absence of a perforation. A free emphysema, in injuries of the esophagus, is caused by the inspiration of air. In this instance, esophagoscopy is an important factor in causing predisposition.

AMBERG, Detroit.

Society Transactions

SECTION ON OPHTHALMOLOGY AND OTO-LARYNGOLOGY OF THE MEDICAL SOCIETY OF THE DISTRICT OF COLUMBIA

Dec. 16, 1927

W. T. DAVIS, *Chairman*

LATERAL SINUS THROMBOSIS. Presented by DR. REGINALD R. WALKER.

Dr. Walker said that he preferred to call the average case "sinus infection" rather than "sinus thrombosis." The object should be to deal with such a case while there is an infection present rather than to wait until a clot is formed. He presented a case of bilateral mastoidectomy, complicated by a unilateral infection of the right lateral sinus, in a child, aged 6. The patient showed the typical temperature of sinus thrombosis, and the blood cultures were positive for *Streptococcus viridans*. The right sinus was selected because this was the first side involved; the left membrana tympani was normal at the time the right mastoid was open, the right mastoid showed spontaneous exposure of the sinus, while in the left mastoid the sinus wall was intact.

The right jugular vein was ligated without any effect on the temperature. A transfusion of 250 cc. of blood was given on the day following the ligation; for the next three days, the temperature was the same as before, 105 F. in the afternoon and normal in the morning. From the fourth day following ligation to the seventh day, the temperature did not exceed 101.2 F. receding to normal in the morning. On the eighth day it suddenly rose to 104 F. Another transfusion of 250 cc. of blood was given. The temperature gradually receded to normal, and the patient was discharged on the thirty-sixth day. Daily blood cultures were positive until the day of the last transfusion, the number of bacteria gradually decreasing following the ligation.

Dr. Walker concluded that early diagnosis is of utmost importance, to be followed by immediate ligation. It is better to err in ligating than to wait for classical symptoms to develop.

DISCUSSION

DR. W. O. BAILEY, Leesburg, Va.: Four cases of lateral sinus thrombosis were reported at the Lowden County Hospital between 1923 and 1926. In one case, death was due to meningitis; three of the patients survived. One patient had a collapsed sinus and one, a child, aged 8, was operated on eight weeks after mastoidectomy had been performed. An abscess of lateral sinus was found walled off. Ligation of the jugular vein was performed under local anesthesia. The temperature continued the same as before operation, from 106 to 98 F. After two weeks, the patient was given ⅙ grain (0.0129 Gm.) of mercuric chloride intravenously. The temperature dropped the next day and remained almost normal for one and one-half days, then rose to 105 and 106 again. Injections of mercuric chloride were given every third day for five injections. The patient recovered. This is the first case that I could find in which a child, aged 8, had had a jugular ligation under local anesthesia.

DR. WALKER: I know of a case of collapse of both lateral sinuses in which it required 211 days for collateral circulation to take place. This patient had a hernia of the brain, corrected by a transplant of fascia lata. I feel that in the first case reported the patient was aided materially by the transfusions of blood.

SOME REMARKS ON THE ACCESSORY SINUSES OF THE NOSE. Presented by DR. O. A. M. MCKINNIE.

Dr. McKinnie stated that in reviewing the paper written by himself in 1899 on nasal diseases as causes of diseases of the eye, the following differences and similarities in treatment at that time and now presented themselves to him. There were no roentgenograms then to aid the physician. Acute maxillary sinusitis usually clears up without puncture, posture being helpful. The alveolar process operation is still the best when a tooth is at fault. The radical maxillary operation is necessary for chronic cases, but Dr. McKinnie does not believe in removing all of the mucous membrane. The complete removal of ethmoids is to be done by the external route, and an intranasal operation on the frontal sinus should not be done. The Killian frontal operation is the best. Any operation on the sphenoid or ethmoid should be regarded as a major operation. Do not curet, but open and drain. One should wait for a protective layer of granulations before curettage of the ethmoid and the sphenoid should never be curetted.

DISCUSSION

DR. WALTER A. WELLS: Bony necrosis takes place early in the infections of the mastoid but practically not at all in infections of the paranasal sinus. The tendency in treatment is swinging from radical to conservative methods.

DAVID DAVIS, M.D., Corresponding Secretary.

SECTION ON OTOLOGY AND LARYNGOLOGY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA

Wednesday, Dec. 21, 1927

JAMES A. BABBITT, M.D., *Chairman*

CLONIC SPASM OF THE MUSCLES OF THE EUSTACHIAN TUBES. By DR. KARL MUSSER HOUSER.

Politzer, Schwartze, Brunner, Todd and Boeck have observed and described this condition. Such cases are rather infrequent, and a report of such cases has not occurred in the literature of the past twelve years.

The patient presented was a man, aged 24, who, for the past eight months, had experienced annoying clicking sensations in both ears, which was more marked on the right side. The onset of the condition was gradual and was not accompanied by an acute cold or sore throat. Tonsillectomy, tubal catheterization and bougienage did not give relief.

The clicking sound on the right side could be heard by an observer at a distance of 4 feet from the patient. On the left it was barely audible with the auscultation tube. Movement of the drumhead could not be be seen when the clicking sound occurred, nor was there any relation to the pulse beat. If a bougie was inserted into the eustachian tube for a distance of 1.5 cm., the clicking sound on that side was no longer present. The sound, however, reappeared as soon as the bougie was withdrawn. With the nasopharyngoscope it could readily be seen that a contraction of the muscles connected with the anterior lip of the eustachian tube accompanied each clicking sound.

DISCUSSION

DR. GEORGE COATES: I know of a similar case in which this clicking could be heard 10 feet from the patient. In this case, movement of the muscles of the soft palate and movement of the drum occurred with each click. The bougie in this instance did not affect the sound. In another case of suppuration of the ear, an audible click could be stopped by movements of the jaw.

Dr. B. Alexander Randall: In the case of a woman who had chorea, an auditory click was present. The origin of the click was probably from the separation of the moist surfaces of the tube.

Dr. E. B. Gleason: I had my only case of this kind about twenty years ago. The patient improved under treatment with bromides.

Dr. S. MacCuen Smith: Cases of objective tinnitus aurium are infrequent, and their etiology has seldom been determined. We are indebted, therefore, to Dr. Houser for the report of his interesting case and more especially his definite information concerning the etiology, as the clicking ceased when he introduced the bougie into the eustachian tube.

About twenty years ago, I was chairman of the Section on Otology and Laryngology of the American Medical Association, and Professor Gustav Killian, of Frieburg, Germany, was the guest of the section at that time. Following our meeting at Atlantic City, the members were invited to Philadelphia to hear Professor Killian lecture on the subject of foreign bodies in the respiratory tract and their removal. On the following day, the members were invited to participate in some clinics at the Germantown Hospital, at which time I presented a case of bilateral objective clicking tinnitus aurium which could be heard about 3 feet from the patient. Professor Killian's assistant, Dr. Koellreutter, suggested that it might be stopped by the introduction of a catheter and bougie. He tried this on both sides, without any relief; so a different set of muscles was evidently responsible.

Among others, this case elicited considerable interest on the part of Dr. Alfred Stengel, who went to considerable trouble and expense in the perfection of apparatus to determine the cause of the patient's objective tinnitus. The patient became so impressed with her importance from the fact that we had shown her before medical meetings on various occasions that she finally demanded from Dr. Stengel and myself a substantial pecuniary reward "if we expected to learn anything more about her trouble," as she said, and she therefore passed from our observation without our being able to investigate further the cause of her tinnitus.

Demonstration of Tapia's Artificial Larynx. By Dr. Fielding O. Lewis.

In two patients who had had laryngectomies performed, the artificial larynx was demonstrated. The apparatus, which is simple in construction, permits the development of reasonably clear speech after some weeks of practice.

A Study of the Effect of Ceanothus Americanus on the Coagulation Time of the Blood. By Dr. A. A. S. Giordano and Dr. Dwight L. Wilbur (by invitation).

The drug was tested on a group of sixty-two medical students. It was found that for this group the average normal coagulation time when estimated by capillary tubes was five minutes and fifty-four seconds. The observers concluded from their experiment that: 1. The alkaloids of *Ceanothus Americanus* definitely reduce the coagulation time in the normal person. In the series tested this reduction was 20.5 per cent. 2. The maximum effect occurred in thirty minutes and lasted through a period of one hour. After this, a return to normal takes place rather rapidly. 3. A dose of 8 cc. gave the maximal effect. 4. The therapeutic dose recommended is 8 cc. repeated hourly. 5. This drug should be used only as a helpful adjuvant in the checking of hemorrhage.

Parathyroid Extract in Hemorrhage. By Dr. Abraham Cantarow (by invitation).

Calcium is essential to the normal coagulation of blood, but its administration has been comparatively unsuccessful in the treatment of patients with hemorrhage. The probable reason for this is that in the process of coagulation

it appears that the diffusible fraction of the blood calcium is involved. Since it is extremely difficult to increase the proportion of diffusible to nondiffusible calcium by the mere administration of calcium salts, a definite calcium effect cannot be consistently produced by this means. At the present time such an effect can be obtained by the use of parathyroid extract. Following the intramuscular administration of from 15 to 20 units in adults, the clotting time was reduced from 5 to 65 per cent, the first effect being manifest in three hours and the maximum degree of reduction occurring in from eight to twelve hours. In addition to this factor, a favorable influence on hemorrhage is exerted, particularly in jaundice, by the production of a calcium effect in tissues and capillaries, the permeability of cell membranes being diminished.

In 347 patients with hemorrhage from various causes, parathyroid extract was injected intramuscularly in doses of from 15 to 20 units; the treatment was repeated, if necessary, in from thirty to thirty-six hours. The object was to obtain a sharp, transient increase in the available calcium of the blood and tissues or a series of such increases; it had been found in a previous study of pulmonary hemorrhage that the maintenance of a high calcium level increases the hemorrhagic tendency and prolongs the coagulation time.

The bleeding was completely controlled in 304 of the 347 patients observed. Although it is difficult to ascribe cessation of hemorrhage to treatment, certain points favor this view in the present study. The association of a reduction in coagulation time with diminution in bleeding, the successful results obtained after other treatment had failed, and, in some instances, the return of bleeding following the disappearance of the calcium effect and its cessation after a second injection of parathyroid extract suggest that the results were in large part due to this substance.

In most instances a single injection was effective, and in none of the successful cases were more than three necessary to stop the bleeding. Good results cannot be expected in hemorrhage associated with large vessel erosions, extensive areas of tissue infection, diminished retractibility of vessels, purpura hemorrhagica and hemophilia, although the coagulation and bleeding time are reduced in most instances.

The administration of 20 units in ten hours before operation appears to be of aid to the surgeon by creating a drier field of operation and by diminishing postoperative oozing of blood and serum. This is of particular benefit in any surgical procedure on patients with jaundice, since in this condition the hemorrhagic tendency is associated with a disturbance in the availability or utilization of calcium.

DISCUSSION

DR. SMITH: I have used ceanothin extensively since it was placed on the market, the manufacturers assuring my co-workers and me that it could be given in large doses without any untoward results; indeed, we were urged to give it in doses of two or more tablespoonfuls, rather frequently repeated, the results being that many times patients would vomit during tonsillectomy under general anesthesia. We are therefore indebted to Drs. Giordano and Wilbur for their investigations regarding not only the dosage but the duration of the efficiency of the drug. As a result of their experiments, we now know definitely that the drug is just as efficient in a dosage of 2 drachms, and this will lessen the tendency to nausea and vomiting.

We are also indebted to Dr. Abraham Cantarow for his investigations on the use of parathyroid extract. I have been using parathyroid extract — Callip for some time, and I can therefore confirm Dr. Cantarow's observations. At the Jefferson Hospital it has been our custom to give 15 units six hours before operation, although from Dr. Cantarow's studies it seems that the maximum increase in the calcium content is not reached for eight or nine hours. This definite knowledge, is of course valuable, and I shall profit by its application in the future.

DR. GEORGE FETTEROLF: We now know that the alkaloids of *Ceanothus Americanus* will reduce the coagulation time 20 per cent. The work reported has given us the proper dosage and the number of times it should be used.

DR. NATHAN P. STAUFFER: I am surprised that the normal coagulation time is so long. When large vessels are severed, surgical methods should be applied to control bleeding.

PRESENTATION OF SOME OF THE OTO-LARYNGOLOGICAL MATERIAL OF THE MÜTTER MUSEUM. By DR. GEORGE FETTEROLF and DR. HARRY P. SCHENCK.

Book Reviews

HANDBOOK OF DISEASES OF THE NOSE, THROAT AND EAR. By W. L. SYME. Price, $5. Pp. 395. New York: William Wood & Company, 1927.

This is a volume of 395 pages — an excellent treatise setting forth in a concise text the conclusions of a careful clinician. Omitting all discussions that are not strictly to the point, the author states his own conclusions, which have been crystallized from his personal experiences. The author states that the book is written for students and practitioners. It will be read with interest by specialists as well.

Some of the chapters are too brief, especially those dealing with the internal ear. The plea that the book is written for practitioners can hardly excuse this brevity, for by the same token the carefully written text on operative technic would also be out of place. No practitioner of medicine has any legitimate interest in the technic of operations in a highly technical speciality like otolaryngology. The author's familiarity with the clinical phenomena of diseases of the internal ear is not as thorough as it is with those of the middle ear. On page 254 is the statement: "In a destructive lesion of the labyrinth the tendency is to fall towards the opposite side." The tendency to fall in cases of this sort will be toward the same side. In his paragraph on tumors of the acoustic, page 358, the author fails to mention the vestibular reactions which are pathognomic for such tumors. The indications which are given on page 325 for the radical mastoid, when local treatment fails after two or three months' trial, are entirely too sweeping. There are a great many cases in which persistent discharge continues indefinitely under local treatment, but in which the menace from possible complication is negligible; in such cases radical surgical treatment is not required.

On the whole, the author has given us one of the best concise texts on otology that we have seen recently.

PRACTICAL GUIDE TO DISEASES OF THE THROAT, NOSE AND EAR. By WILLIAM LAMB. Revised by Frederick W. Sydenham. Fifth Edition. Price, $4.50. Pp. 450, with 31 full-page plates of skiagraphs of the head. New York: William Wood & Company, 1927.

The authors state that the book is intended for senior students and junior practitioners. They make a point of the fact that both of them had practiced general medicine for many years before taking up the specialty. Most men who spend many years doing general work never quite succeed in mastering the details which the developments in the field of otolaryngology now require.

This book is a record of clinical experiences gleaned from active practice and apparently jotted down in spare moments. There is little, if any, evidence of any effort to be systematic or to present the subject of otolaryngology as a whole. For this reason the junior practitioners will have great difficulty in looking up any particular subject, as the discussions of many of the conditions are found scattered indiscriminately throughout the book. The same subject is often discussed in several different places, and sometimes out of its proper place; for example, the authors discuss acute otitis media under the caption of diseases of the external ear. They present conclusions which are founded on clinical experience, while they apparently lack the background of study in the fundamental sciences which should be a part of the preparation for special practice. It is not surprising to find them referring to the condition known as otosclerosis as "cases due to a true sclerosis of the middle ear." Although the book contains much that is of clinical interest, it loses a great deal by the failure to present the matter in an orderly, systematic manner.

PLASTIC SURGERY OF THE ORBIT. By J. EASTMAN SHEEHAN, M.D. Pp. 348. Price, $12.00. New York: The Macmillan Company, 1927.

This volume, which is profusely illustrated, is the second monograph by the author on plastic surgery of the face. The first volume, entitled "Plastic Surgery of the Nose," appeared two years ago (ARCH. OTOLARYNG. **3**:98 [Jan.] 1926).

"Plastic Surgery of the Orbit" includes a pleasing preface by Prof. Pierre Sebileau of the Faculty of Medicine of Paris.

The publication of such works as these by Dr. Sheehan aids materially in lifting this phase of surgery from the slough of the quack beauty doctor to its legitimate place.

The author divides this work into three parts. The first part deals with the anatomy and physiology, a review of which should form the basis in the preparation for this sort of work. Part two deals with the preparation of the patient, the after-care, skin graft and general surgical considerations. Part three is on operative procedures and contains detailed descriptions of the several operations about the eye. The illustrations throughout are excellent, and the text is clear and easily followed. This is a real contribution to a field of surgery that is in many respects quite new, having been born in a large measure from the impulse received during the Great War. The author is to be congratulated on the successful manner in which he has presented this interesting phase of surgical work.

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NATIONAL

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LOCAL

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Secretary: Dr. M. B. Selingstein, 801 Union and Planters Bank Bldg., Memphis, Tenn.
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CONTENTS

PAGE

Simple Subcortical Mastoidectomy. Julius Lempert, M.D., New York 201

Nonopaque Foreign Bodies in the Esophagus and Esophagotracheal Fistula: Their Demonstration by Ingested Iodized Oil. Samuel Iglauer, M.D., Cincinnati..... 229

Standardizing the Tuning Fork. Douglas Macfarlan, M.D., Philadelphia 234

Peritonsillar Infection. Samuel D. Greenfield, M.D., Brooklyn 239

Clinical Notes:

The Nasal Ganglion and Chorea: Case of a Patient Permanently Relieved by the Injection of Alcohol. Hiram Byrd, M.D., Tampa, Fla..... 257

Instruments for Injections of Iodized Oil into the Sinuses: New Adaptations for Opaque Injection into the Accessory Sinuses of the Nose and Ear. Robert H. Fraser, M.B. (Tor.), Battle Creek, Mich. 258

Progress in Otolaryngology: A Summary of the Bibliographic Material Available in the Field of Otolaryngology. Peroral Endoscopy. Louis H. Clerf, M.D., Philadelphia 261

Abstracts from Current Literature 284

Society Transactions:

Section on Ophthalmology and Oto-Laryngology of the Medical Society of the District of Columbia..... 288

Section on Otology and Laryngology of the College of Physicians of Philadelphia 289

Book Reviews 293

Directory of Ophthalmological and Otolaryngological Societies 295